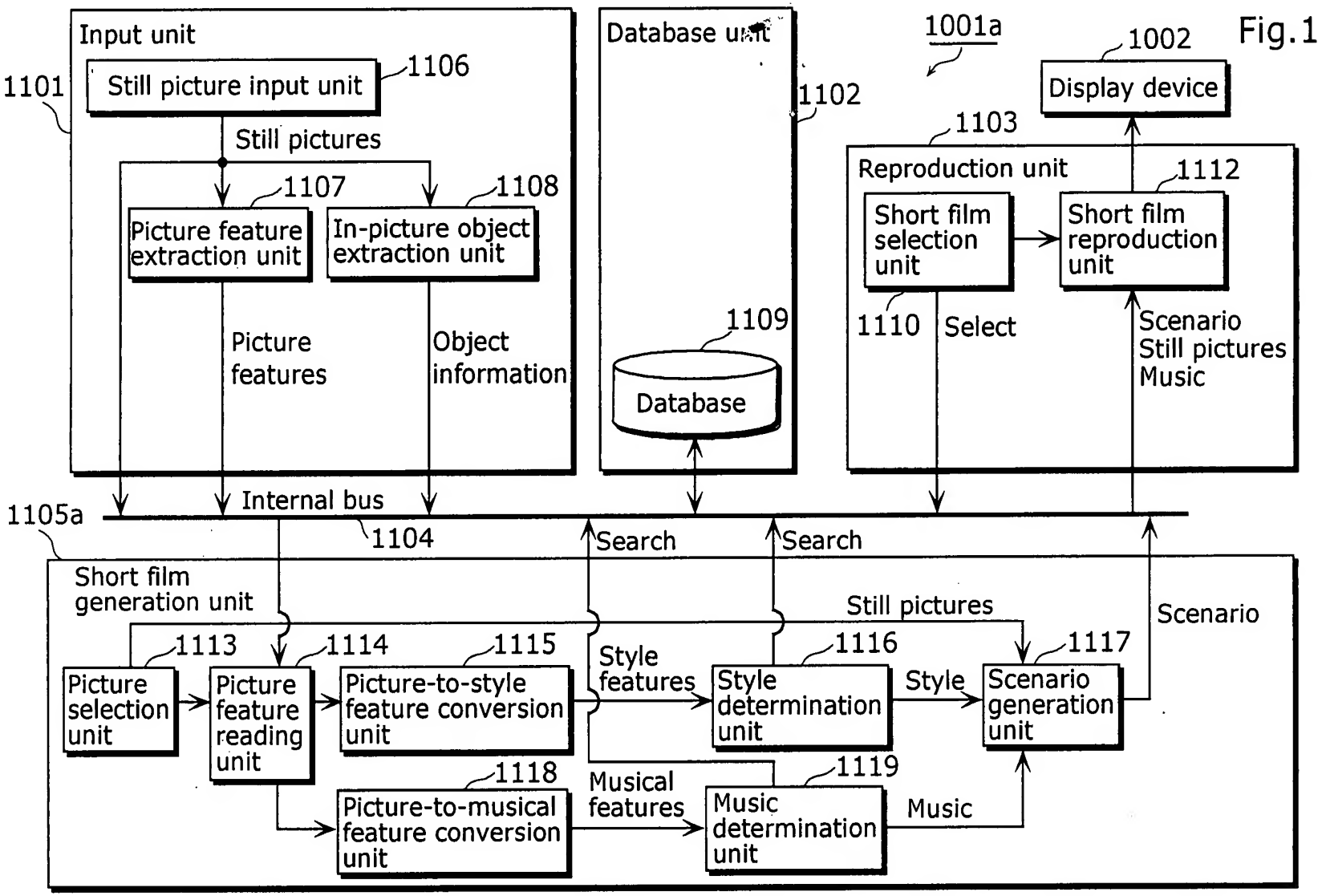

Input unit
1101
Still picture input unit
1106
Still pictures
1107
1108
Picture feature extraction unit
In-picture object extraction unit
Picture features
Object information
Database unit
1102
1109
Database
1001a
1002
Display device
1103
Reproduction unit
1112
Short film selection unit
Short film reproduction unit
1110
Select
Scenario
Still pictures
Music
1105a
Internal bus
1104
Search
Search
Short film generation unit
Still pictures
Scenario
1113
1114
1115
Style features
1116
1117
Picture selection unit
Picture feature reading unit
Picture-to-style feature conversion unit
Style determination unit
Style
Scenario generation unit
1118
Musical features
1119
Picture-to-musical feature conversion unit
Music determination unit
Music

Fig.1

Fig.2

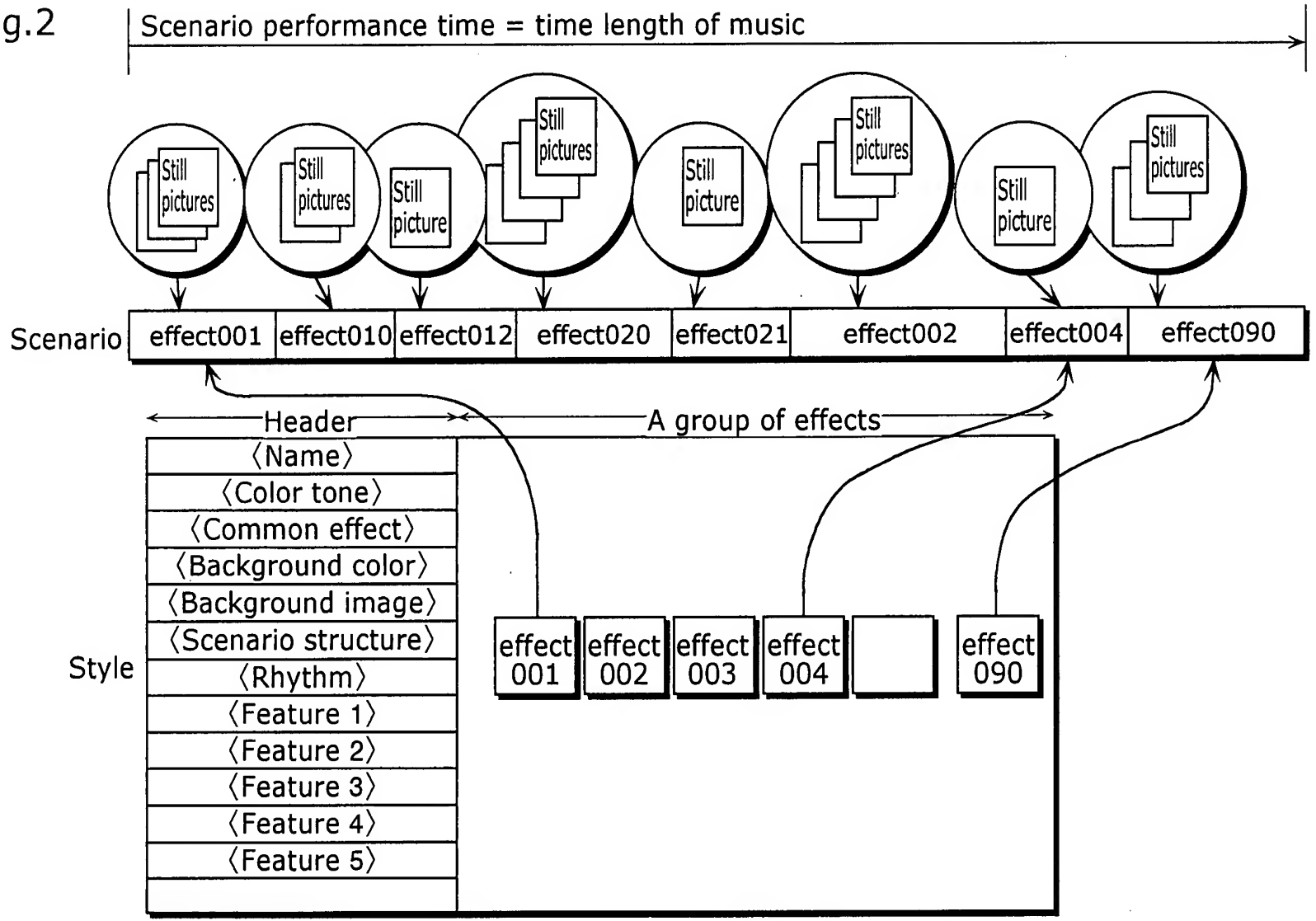

Scenario performance time = time length of music
Still pictures
Still picture
Scenario
effect001
effect010
effect012
effect020
effect021
effect002
effect004
effect090
Header
A group of effects
〈Name〉
〈Color tone〉
〈Common effect〉
〈Background color〉
〈Background image〉
〈Scenario structure〉
〈Rhythm〉
〈Feature 1〉
〈Feature 2〉
〈Feature 3〉
〈Feature 4〉
〈Feature 5〉
Style
effect 001
effect 002
effect 003
effect 004
effect 090

Fig.3

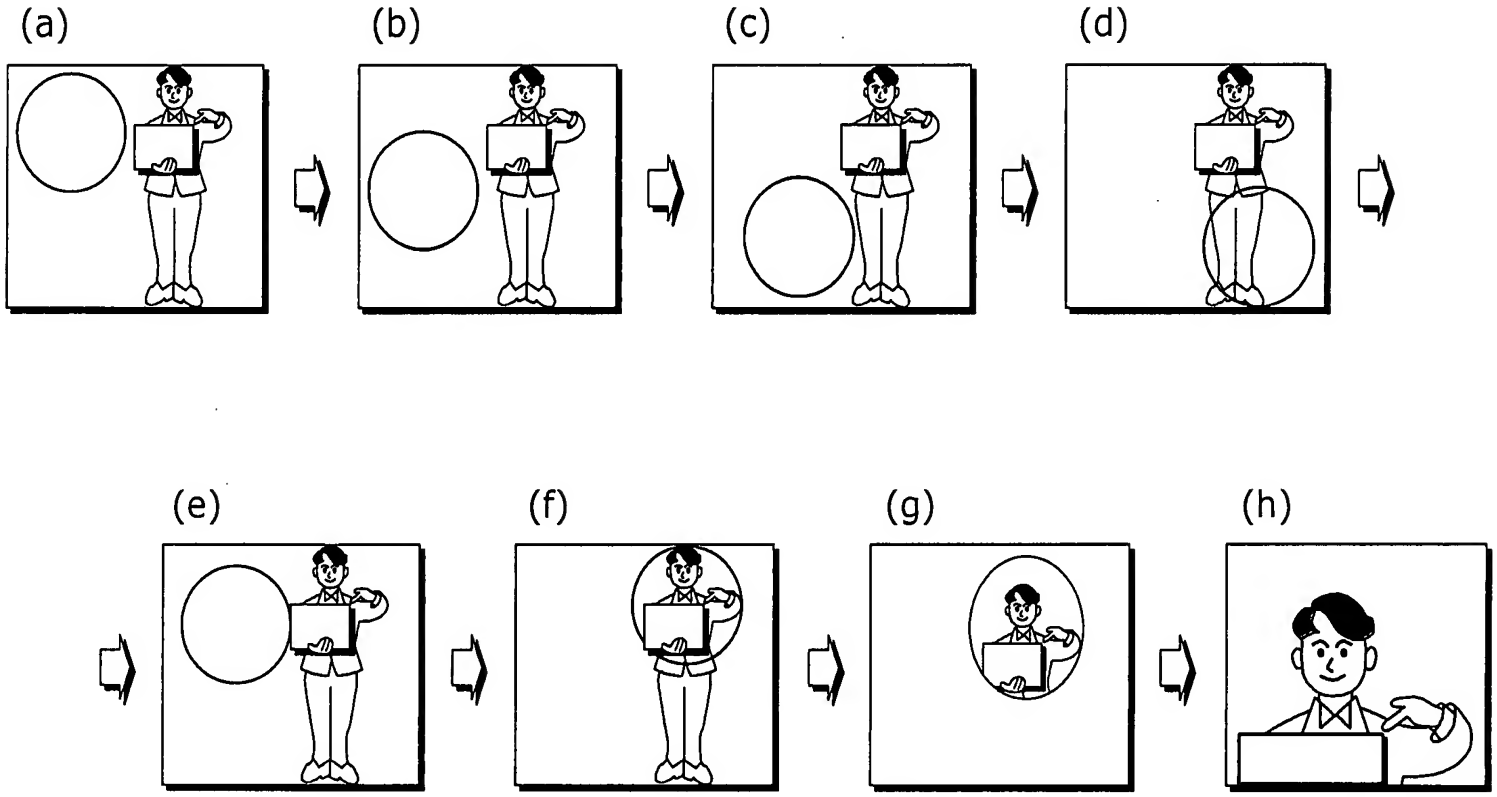


Fig.4

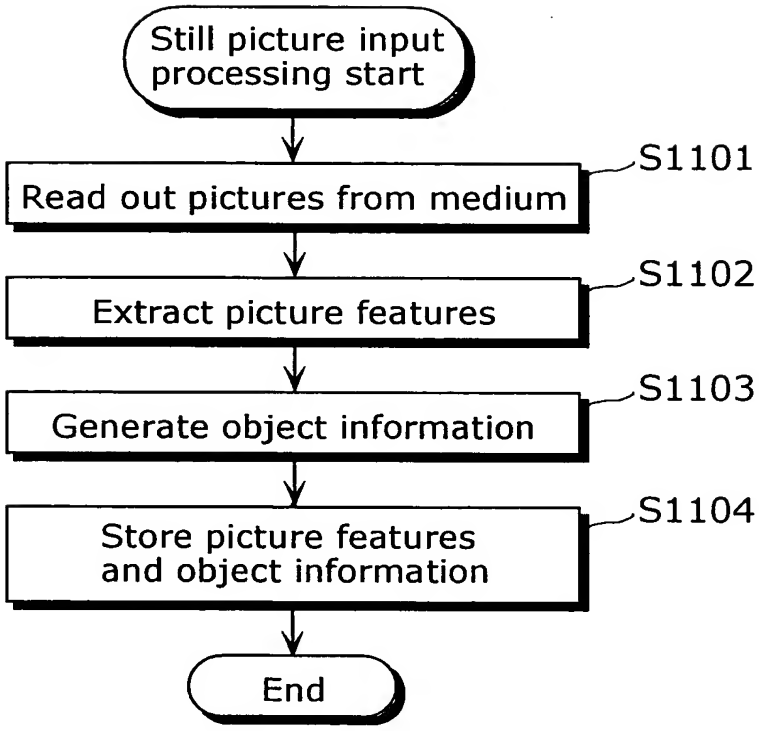

Still picture input processing start
S1101
Read out pictures from medium
S1102
Extract picture features
S1103
Generate object information
S1104
Store picture features and object information
End

Fig.5

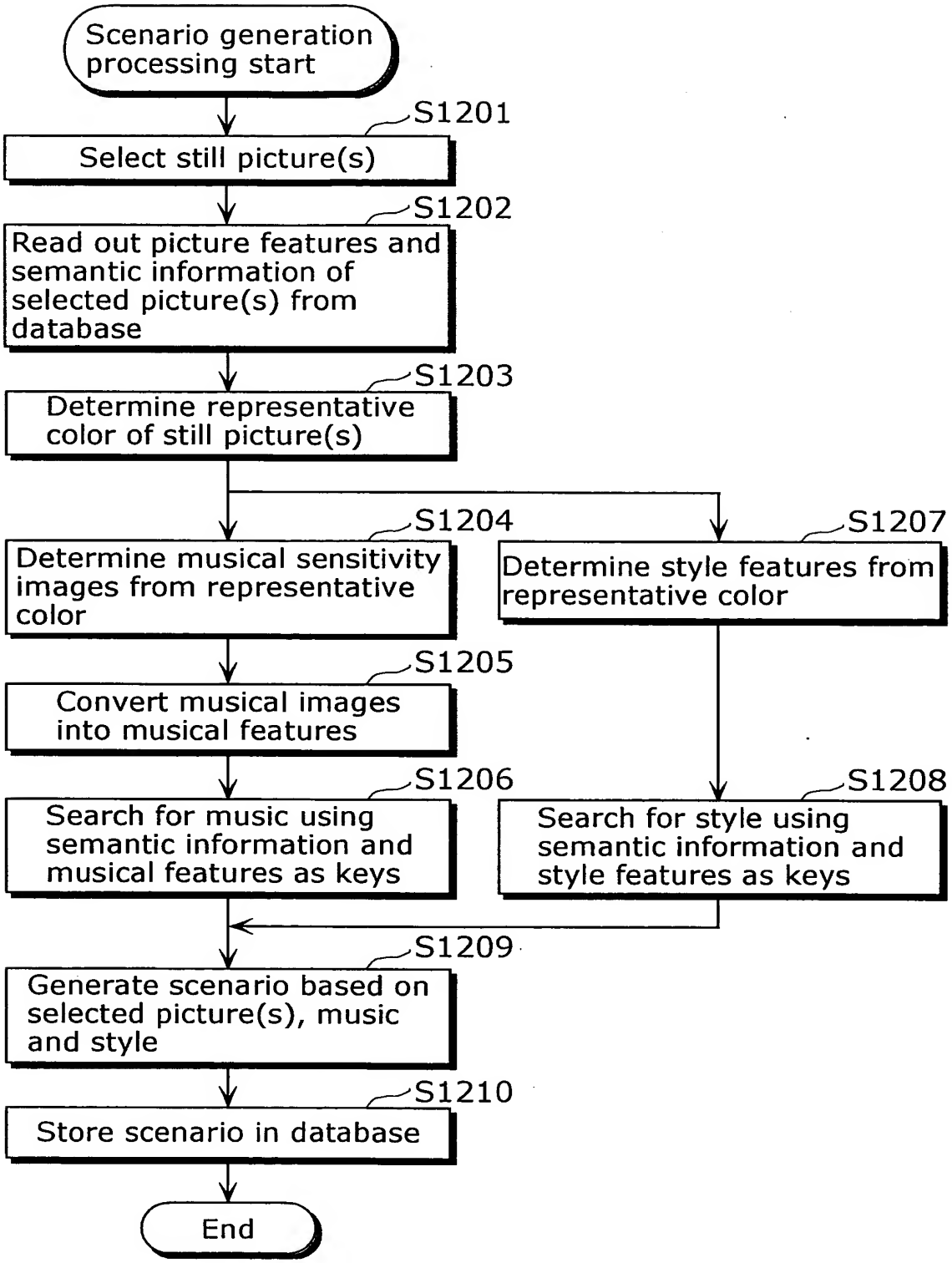

Scenario generation processing start
S1201
Select still picture(s)
S1202
Read out picture features and semantic information of selected picture(s) from database
S1203
Determine representative color of still picture(s)
S1204
Determine musical sensitivity images from representative color
S1205
Convert musical images into musical features
S1206
Search for music using semantic information and musical features as keys
S1207
Determine style features from representative color
S1208
Search for style using semantic information and style features as keys
S1209
Generate scenario based on selected picture(s), music and style
S1210
Store scenario in database
End

Fig.6

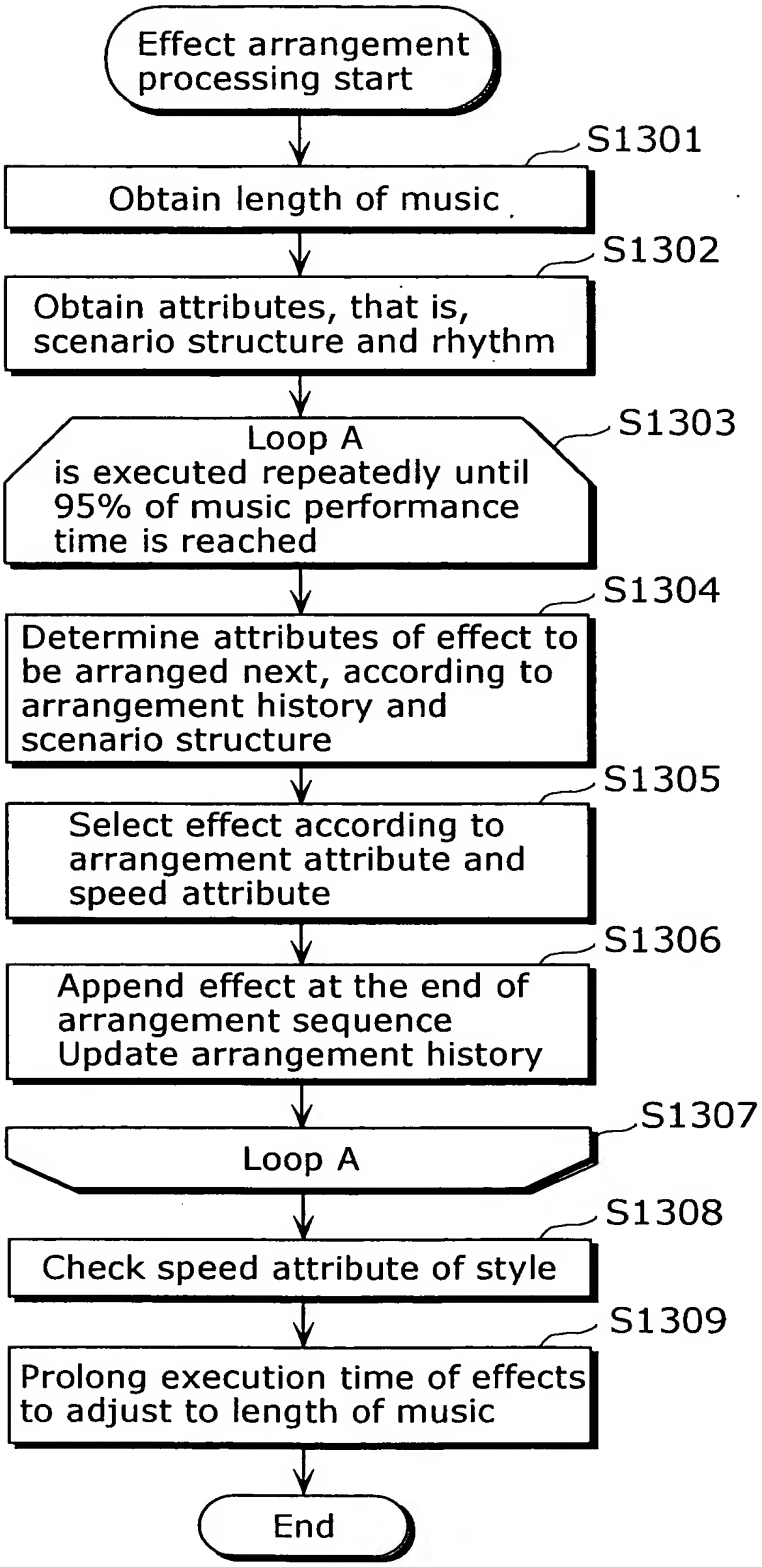
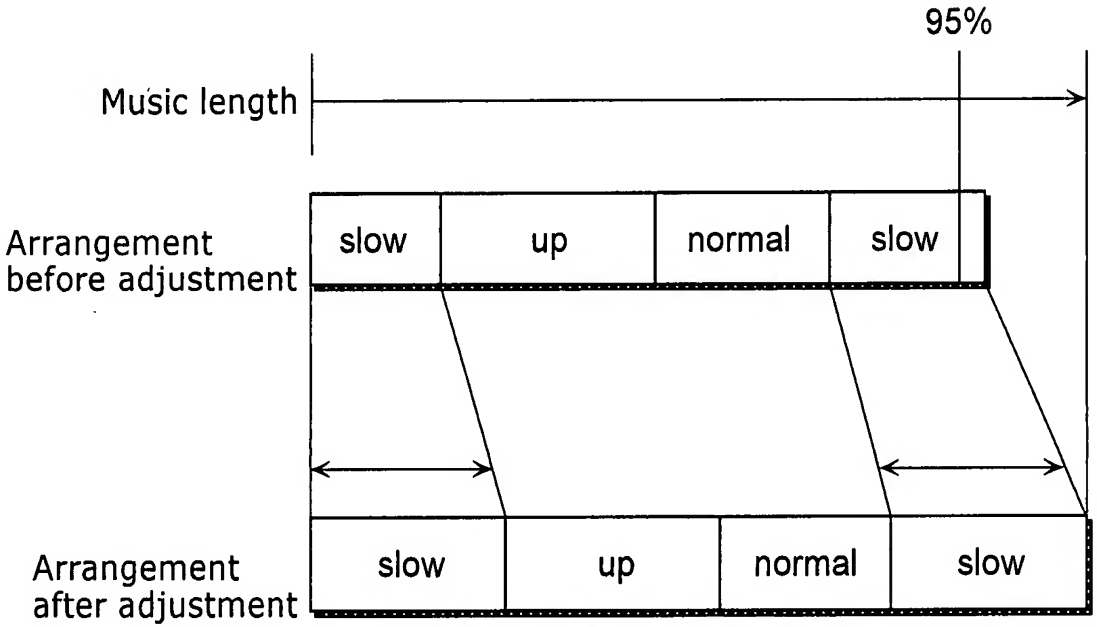

Effect arrangement processing start
S1301
Obtain length of music
S1302
Obtain attributes, that is, scenario structure and rhythm
S1303
Loop A is executed repeatedly until 95% of music performance time is reached
S1304
Determine attributes of effect to be arranged next, according to arrangement history and scenario structure
S1305
Select effect according to arrangement attribute and speed attribute
S1306
Append effect at the end of arrangement sequence Update arrangement history
S1307
Loop A
S1308
Check speed attribute of style
S1309
Prolong execution time of effects to adjust to length of music
End

Fig.7


95%
Music length
Arrangement
before adjustment
slow
up
normal
slow
Arrangement
after adjustment
slow
up
normal
slow

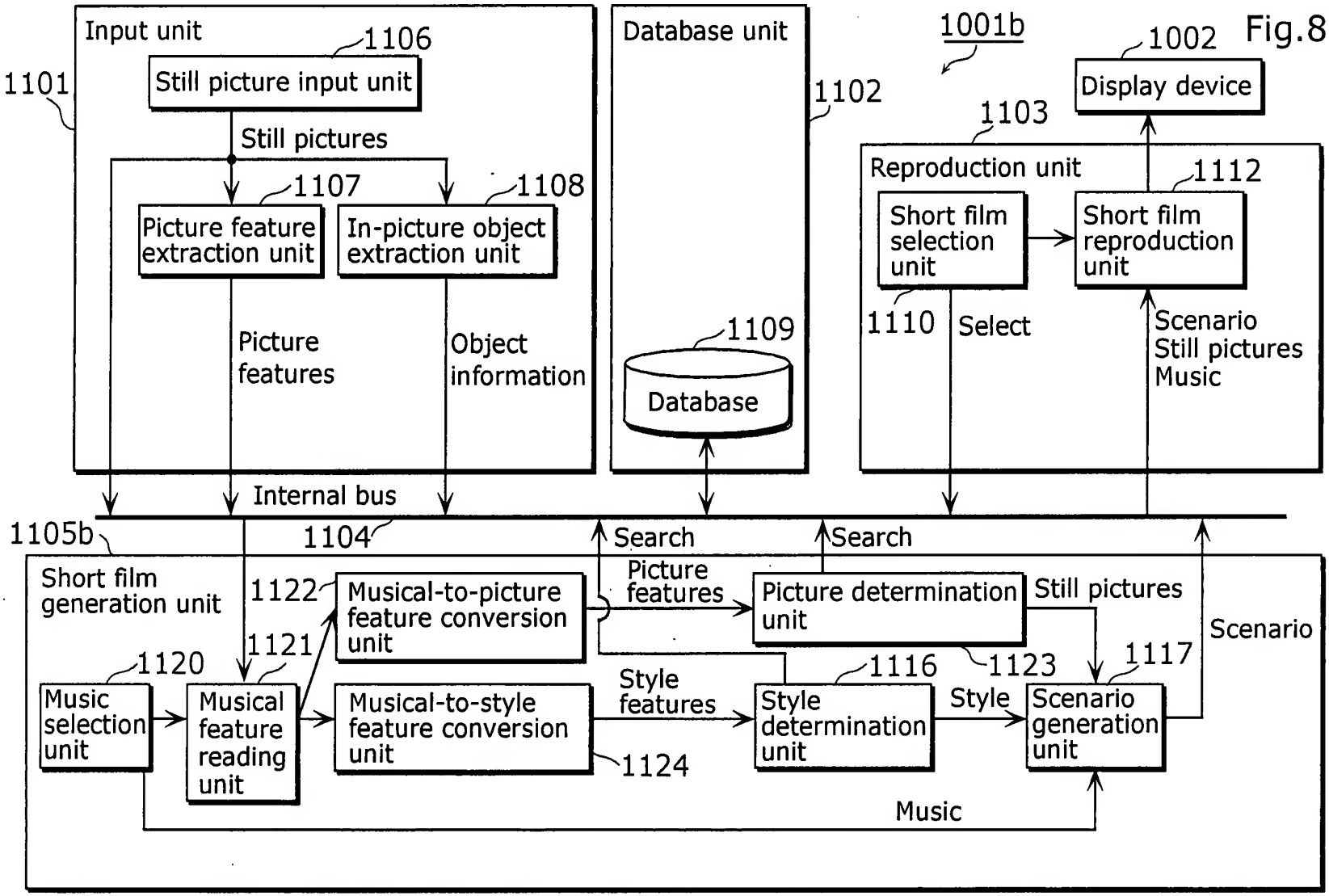
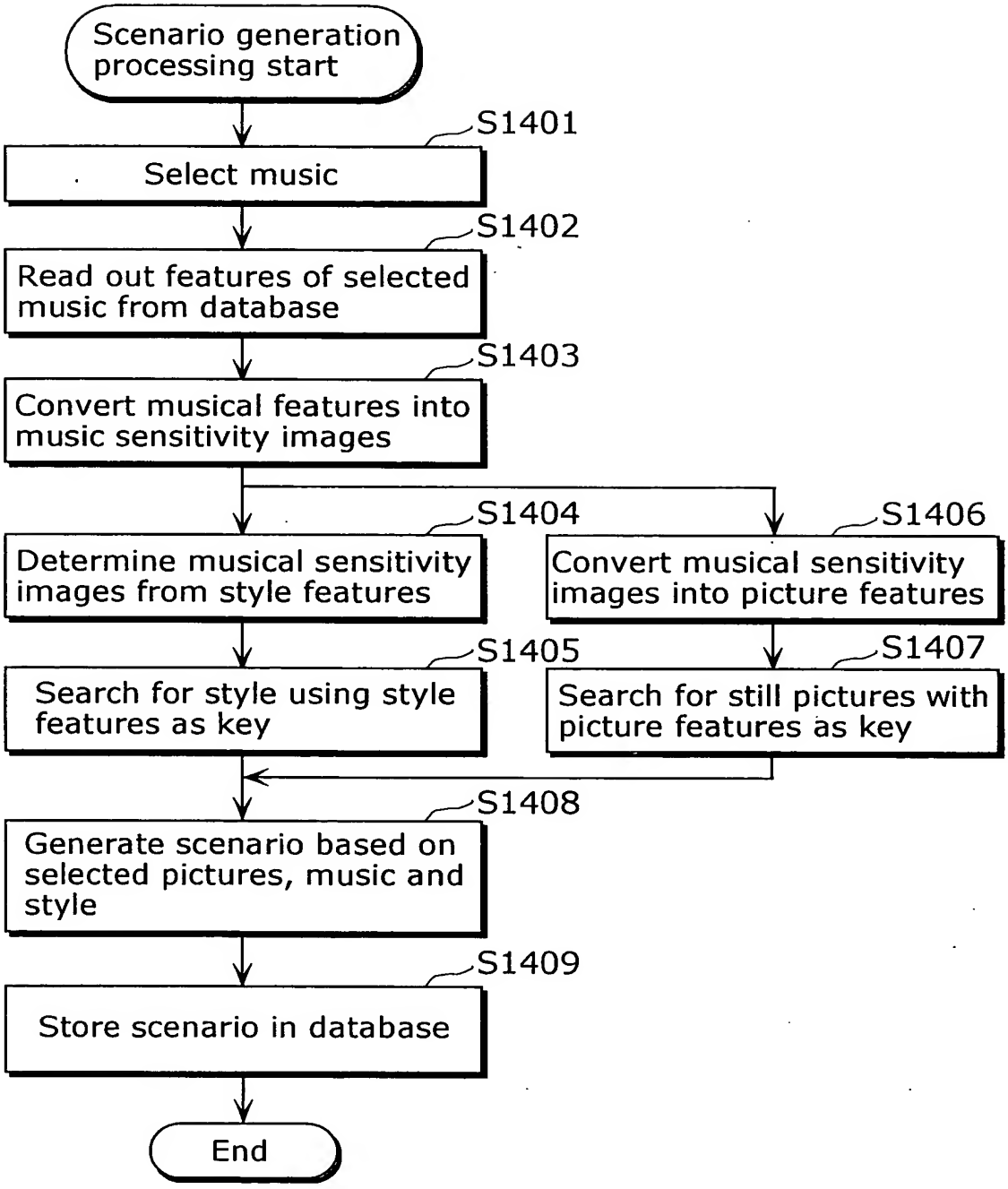

Input unit
1106
Still picture input unit
1101
Still pictures
1107
1108
Picture feature extraction unit
In-picture object extraction unit
Picture features
Object information
Database unit
1102
1109
Database
1001b
1002
Display device
1103
Reproduction unit
1112
Short film selection unit
Short film reproduction unit
1110
Select
Scenario
Still pictures
Music
Internal bus
1105b
1104
Search
Search
Short film generation unit
1122
Musical-to-picture feature conversion unit
Picture features
Picture determination unit
Still pictures
Scenario
1121
1120
1116
1123
1117
Music selection unit
Musical feature reading unit
Musical-to-style feature conversion unit
Style features
Style determination unit
Style
Scenario generation unit
1124
Music

Fig.8

Fig.9


Scenario generation processing start
S1401
Select music
S1402
Read out features of selected music from database
S1403
Convert musical features into music sensitivity images
S1404
Determine musical sensitivity images from style features
S1406
Convert musical sensitivity images into picture features
S1405
Search for style using style features as key
S1407
Search for still pictures with picture features as key
S1408
Generate scenario based on selected pictures, music and style
S1409
Store scenario in database
End

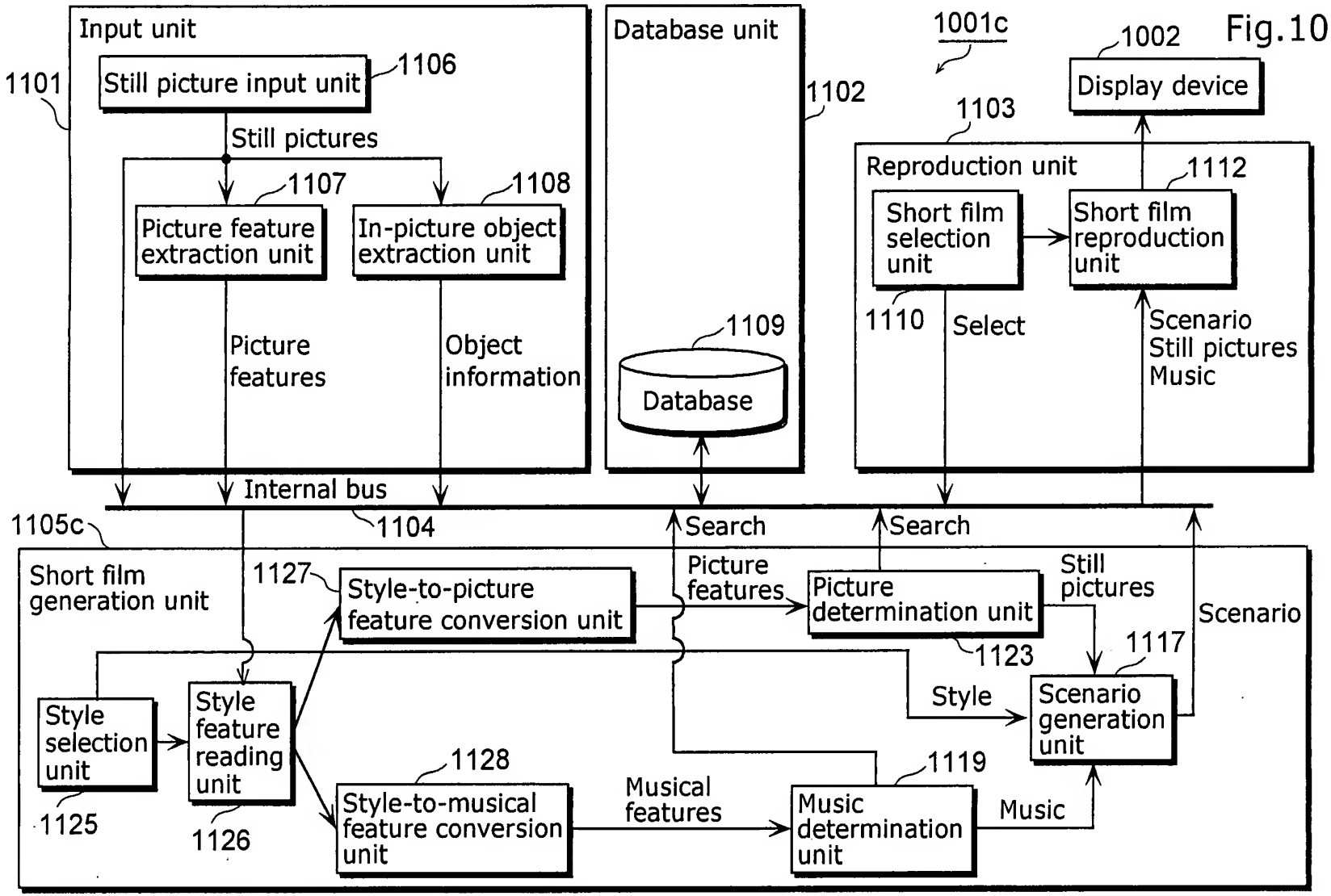
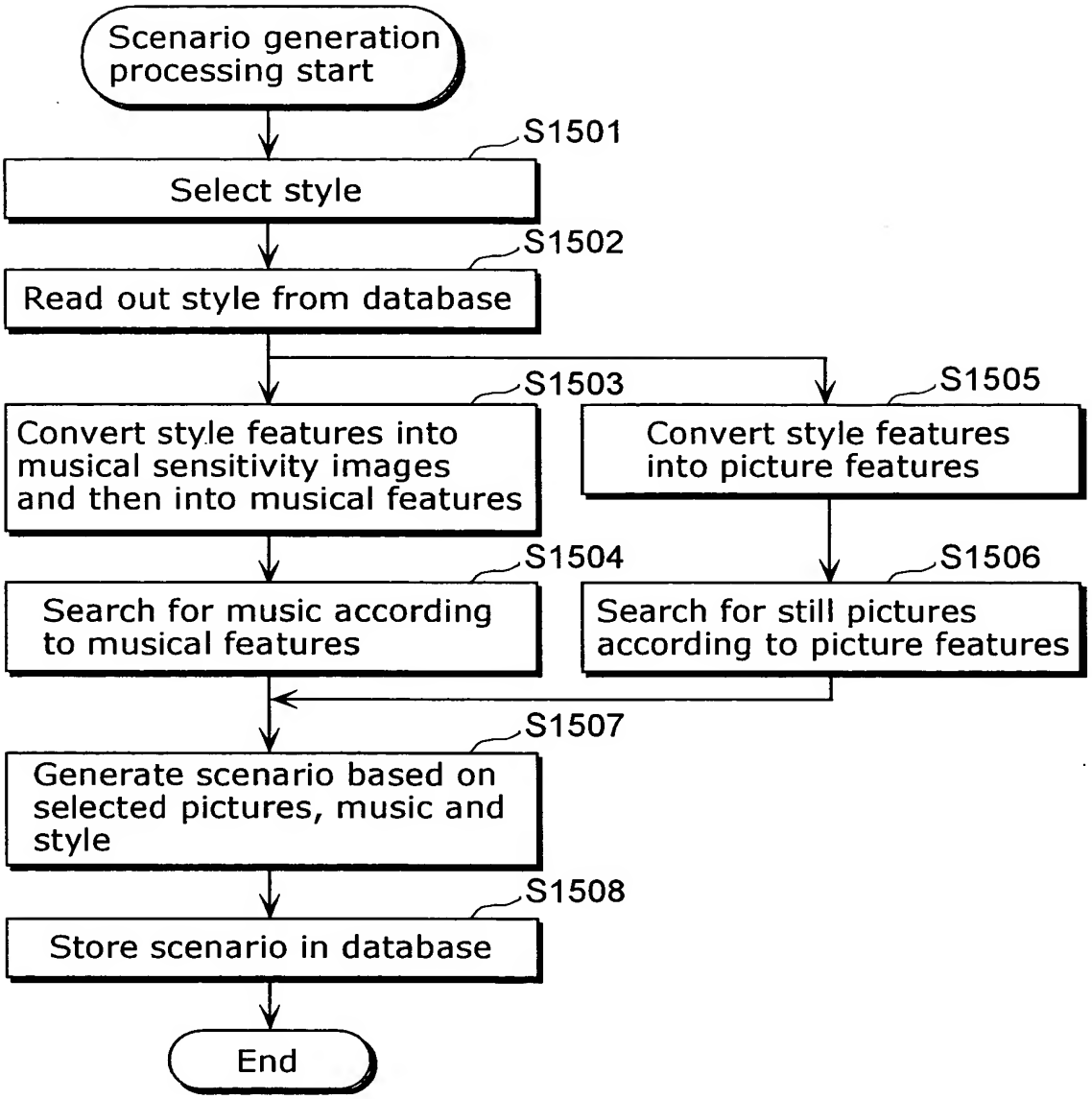

Input unit
1101
Still picture input unit
1106
Still pictures
1107
1108
Picture feature extraction unit
In-picture object extraction unit
Picture features
Object information
Database unit
1102
1109
Database
1001c
1002
Display device
1103
Reproduction unit
1112
Short film selection unit
Short film reproduction unit
1110
Select
Scenario
Still pictures
Music
Internal bus
1104
1105c
Search
Search
Short film generation unit
1127
Style-to-picture feature conversion unit
Picture features
Picture determination unit
Still pictures
Scenario
1123
1117
Style
Scenario generation unit
Style selection unit
Style feature reading unit
1125
1126
1128
Style-to-musical feature conversion unit
Musical features
1119
Music determination unit
Music

Fig.10

Fig.11


Scenario generation processing start
S1501
Select style
S1502
Read out style from database
S1503
Convert style features into musical sensitivity images and then into musical features
S1505
Convert style features into picture features
S1504
Search for music according to musical features
S1506
Search for still pictures according to picture features
S1507
Generate scenario based on selected pictures, music and style
S1508
Store scenario in database
End

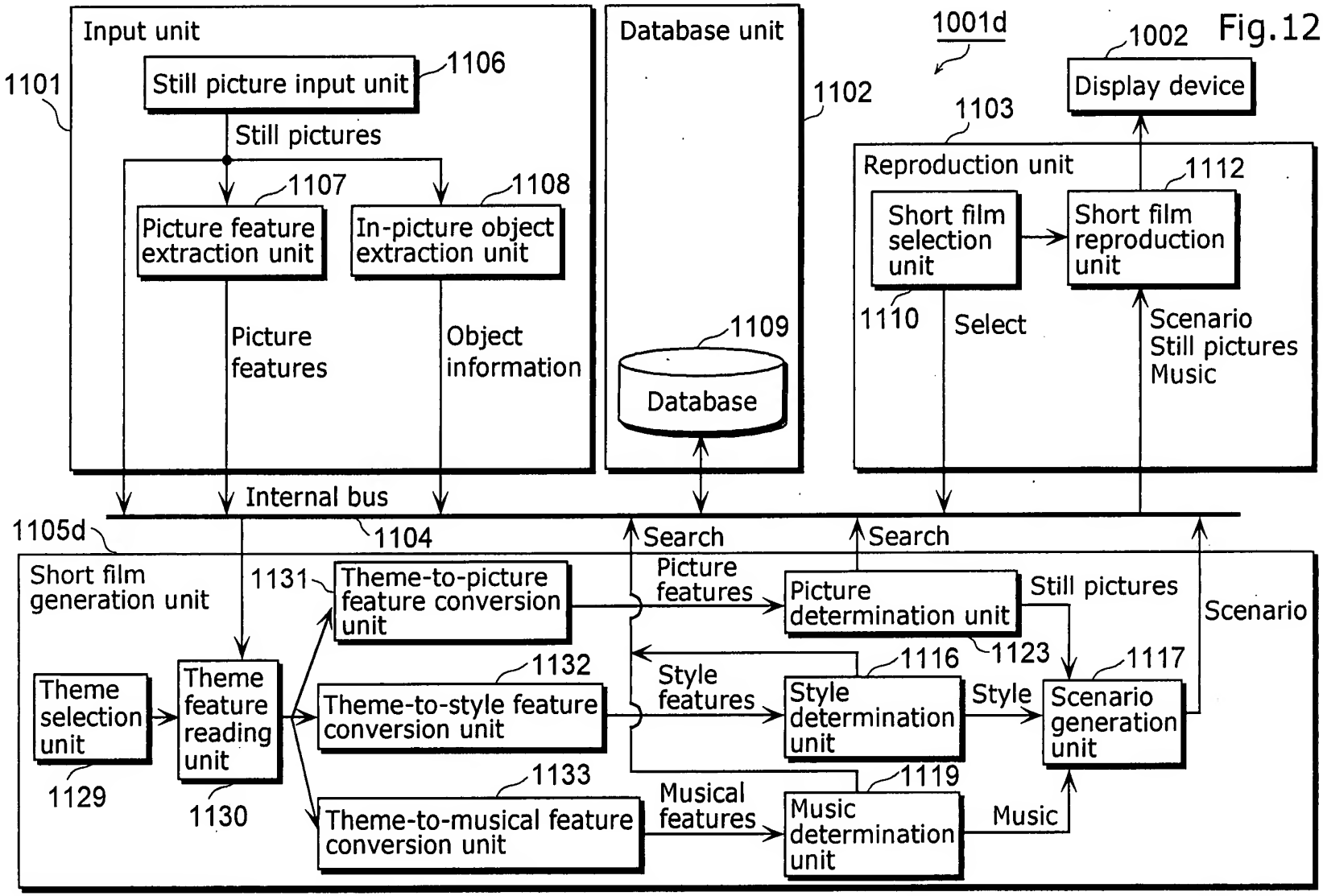

Input unit
1101
Still picture input unit
1106
Still pictures
1107
1108
Picture feature extraction unit
In-picture object extraction unit
Picture features
Object information
Database unit
1102
1109
Database
1001d
1002
Display device
1103
Reproduction unit
1112
Short film selection unit
Short film reproduction unit
1110
Select
Scenario
Still pictures
Music
Internal bus
1104
1105d
Search
Search
Short film generation unit
1131
Theme-to-picture feature conversion unit
Picture features
Picture determination unit
Still pictures
1123
Scenario
1116
1117
1132
Theme selection unit
Theme feature reading unit
Theme-to-style feature conversion unit
Style features
Style determination unit
Style
Scenario generation unit
1129
1130
1133
1119
Theme-to-musical feature conversion unit
Musical features
Music determination unit
Music

Fig.12

Fig.13

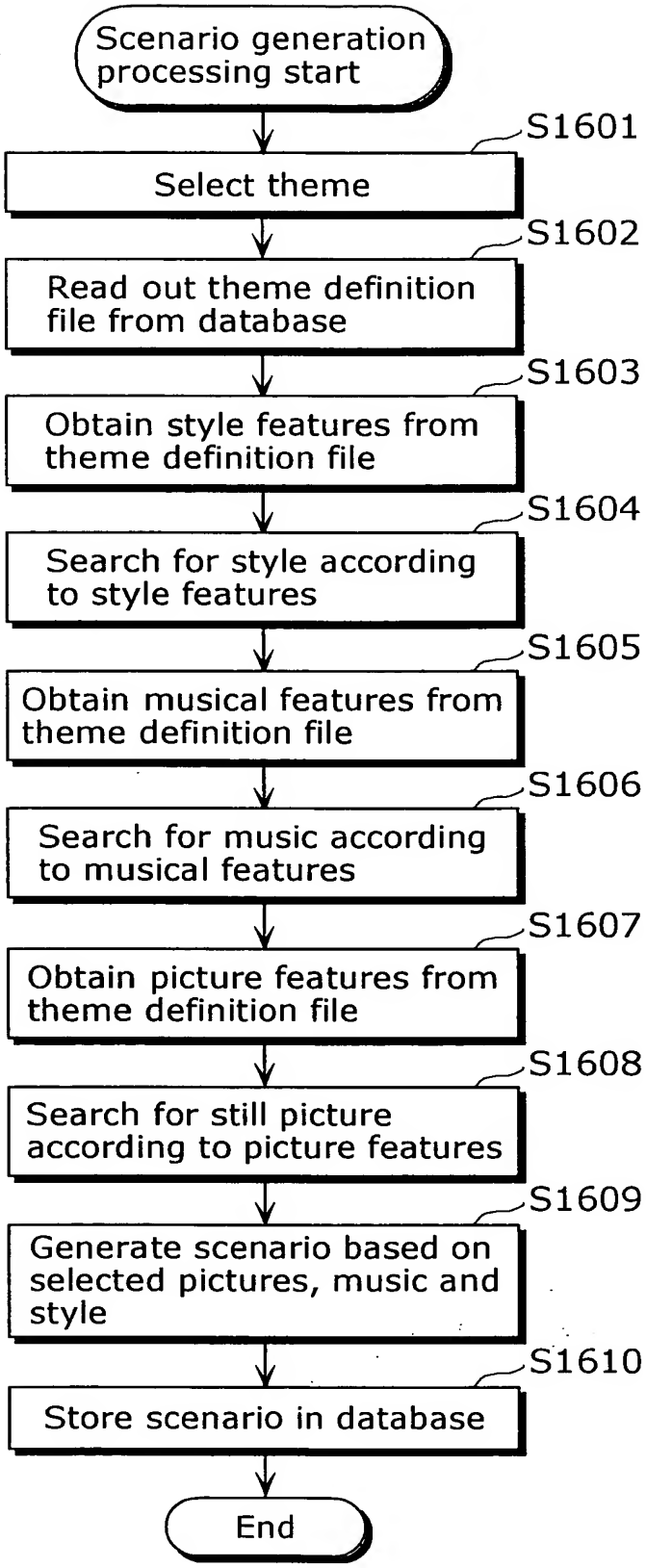

Scenario generation processing start
S1601
Select theme
S1602
Read out theme definition file from database
S1603
Obtain style features from theme definition file
S1604
Search for style according to style features
S1605
Obtain musical features from theme definition file
S1606
Search for music according to musical features
S1607
Obtain picture features from theme definition file
S1608
Search for still picture according to picture features
S1609
Generate scenario based on selected pictures, music and style
S1610
Store scenario in database
End

Fig.14

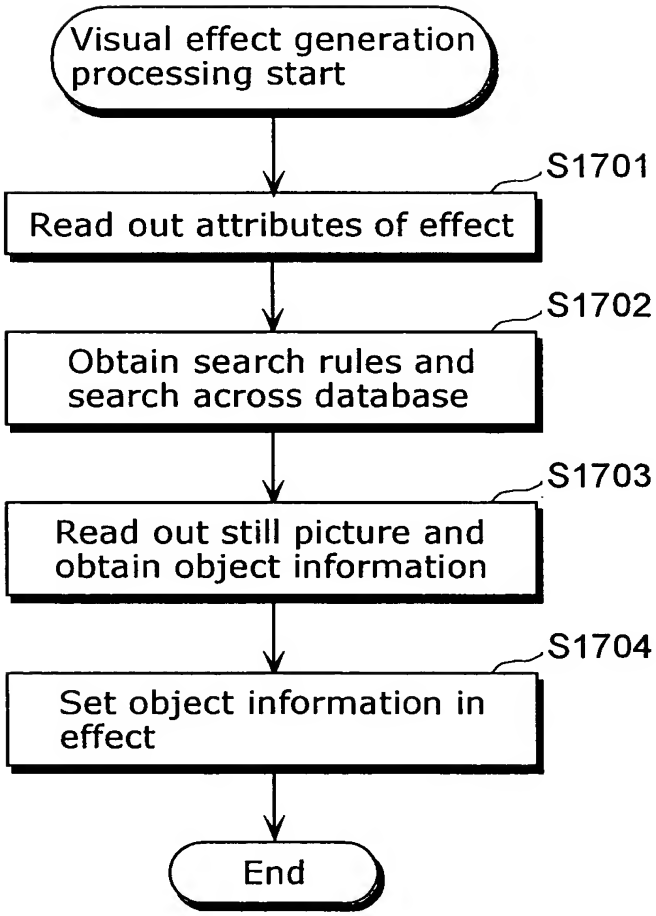

Visual effect generation processing start
S1701
Read out attributes of effect
S1702
Obtain search rules and search across database
S1703
Read out still picture and obtain object information
S1704
Set object information in effect
End

Fig.15

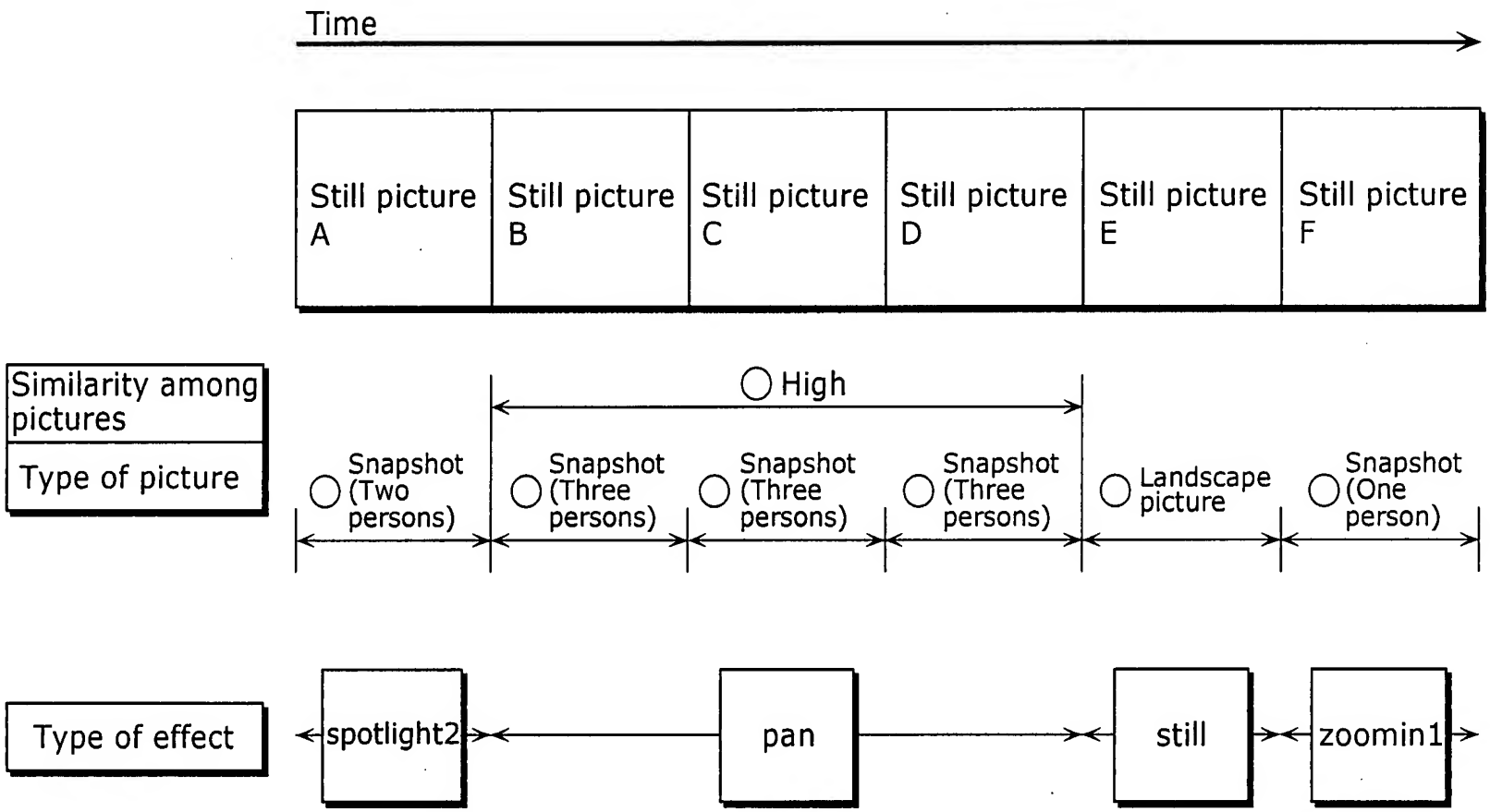

Time
Still picture A
Still picture B
Still picture C
Still picture D
Still picture E
Still picture F
Similarity among pictures
High
Type of picture
Snapshot (Two persons)
Snapshot (Three persons)
Snapshot (Three persons)
Snapshot (Three persons)
Landscape picture
Snapshot (One person)
Type of effect
spotlight2
pan
still
zoomin1

Fig.16

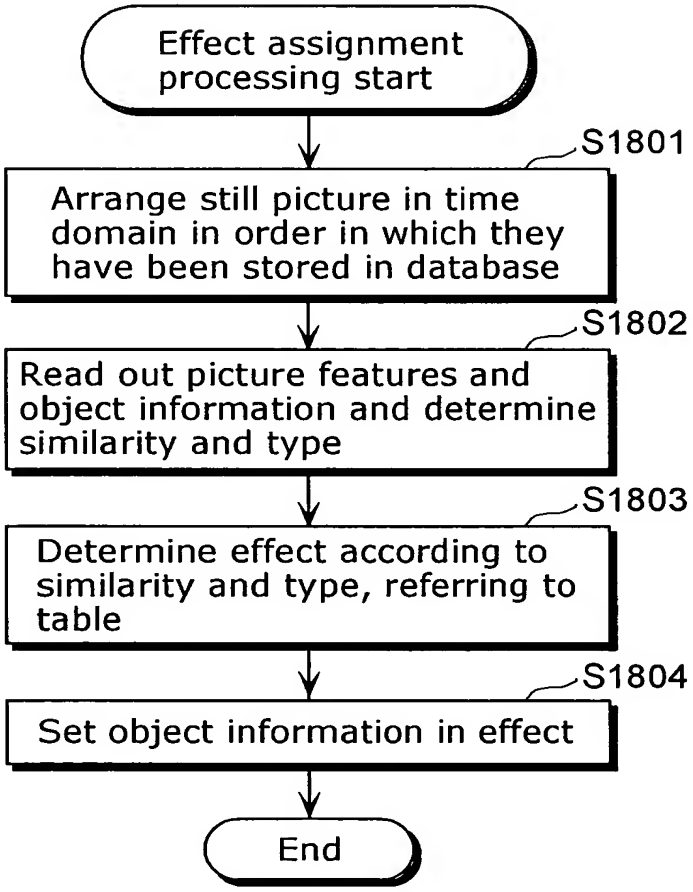

Effect assignment processing start
S1801
Arrange still picture in time domain in order in which they have been stored in database
S1802
Read out picture features and object information and determine similarity and type
S1803
Determine effect according to similarity and type, referring to table
S1804
Set object information in effect
End

Fig.17

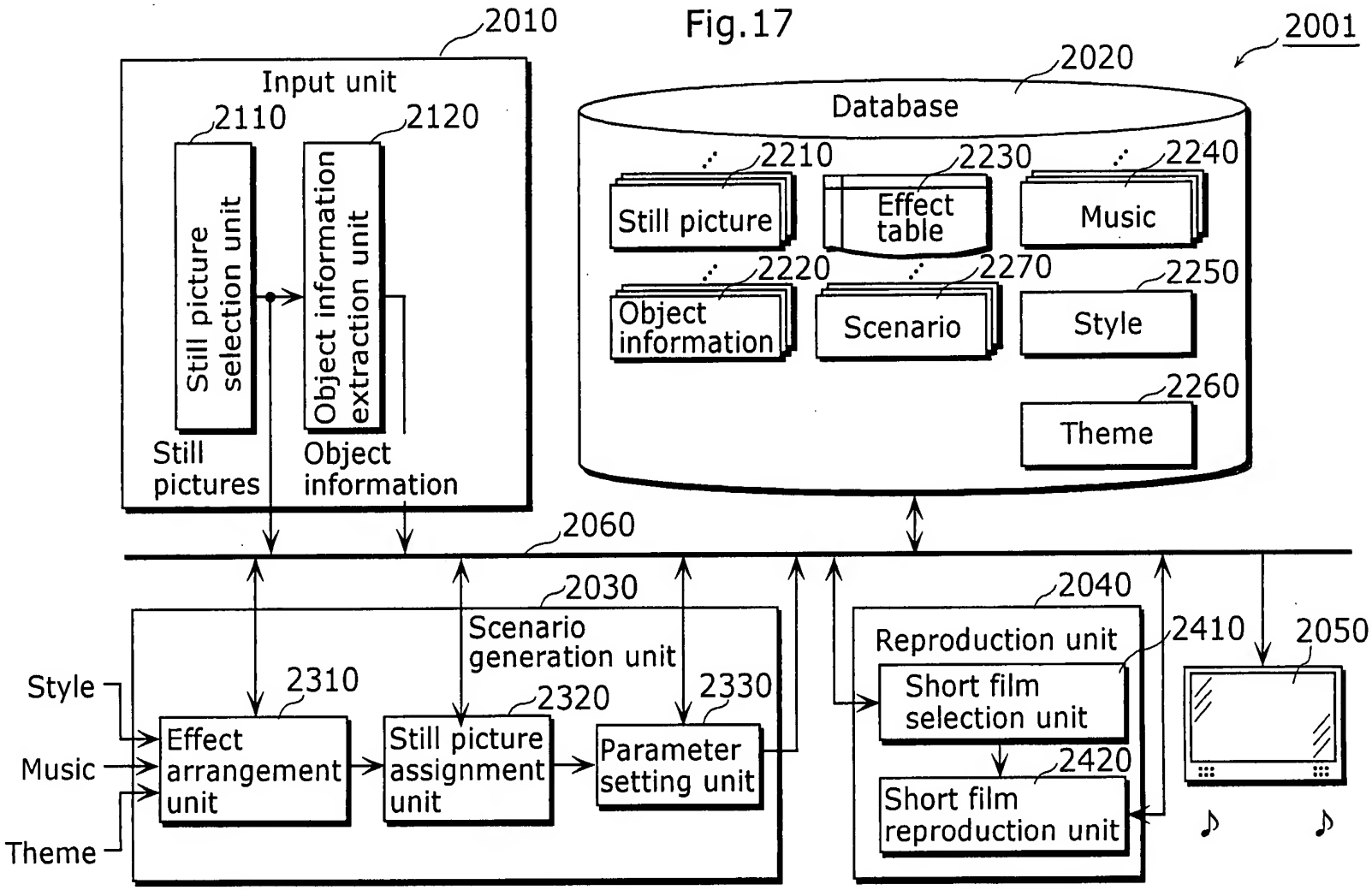

2001
2010
Input unit
2110
Still picture selection unit
2120
Object information extraction unit
Still pictures
Object information
2020
Database
2210
Still picture
2230
Effect table
2240
Music
2220
Object information
2270
Scenario
2250
Style
2260
Theme
2060
2030
Scenario generation unit
2310
Effect arrangement unit
2320
Still picture assignment unit
2330
Parameter setting unit
Style
Music
Theme
2040
Reproduction unit
2410
Short film selection unit
2420
Short film reproduction unit
2050

Fig.18

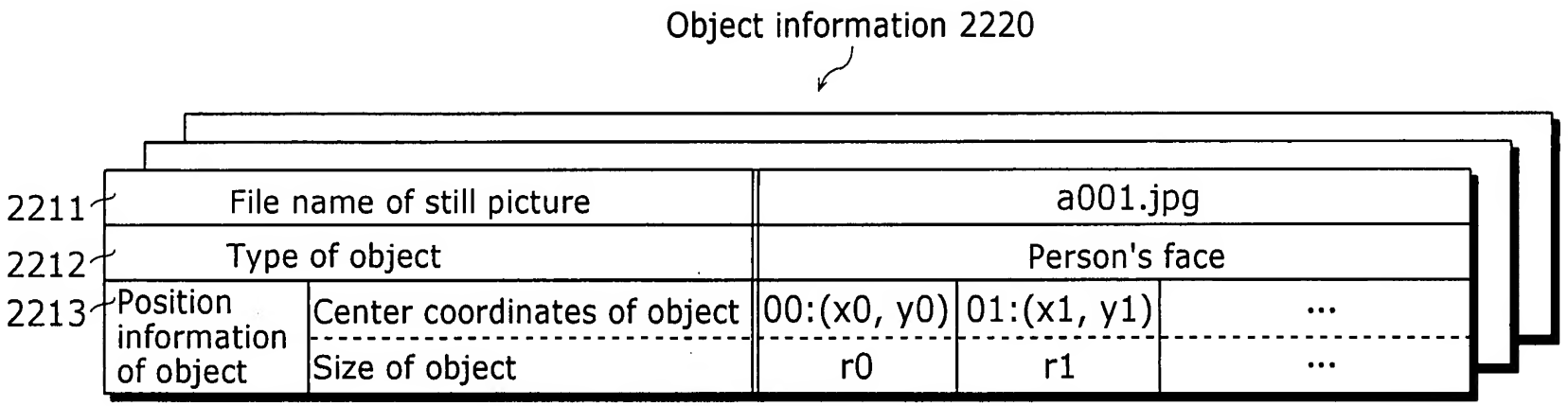

Object information 2220
2211
File name of still picture
a001.jpg
2212
Type of object
Person's face
2213
Position information of object
Center coordinates of object
00:(x0, y0)
01:(x1, y1)
...
Size of object
r0
r1
...

Fig.19

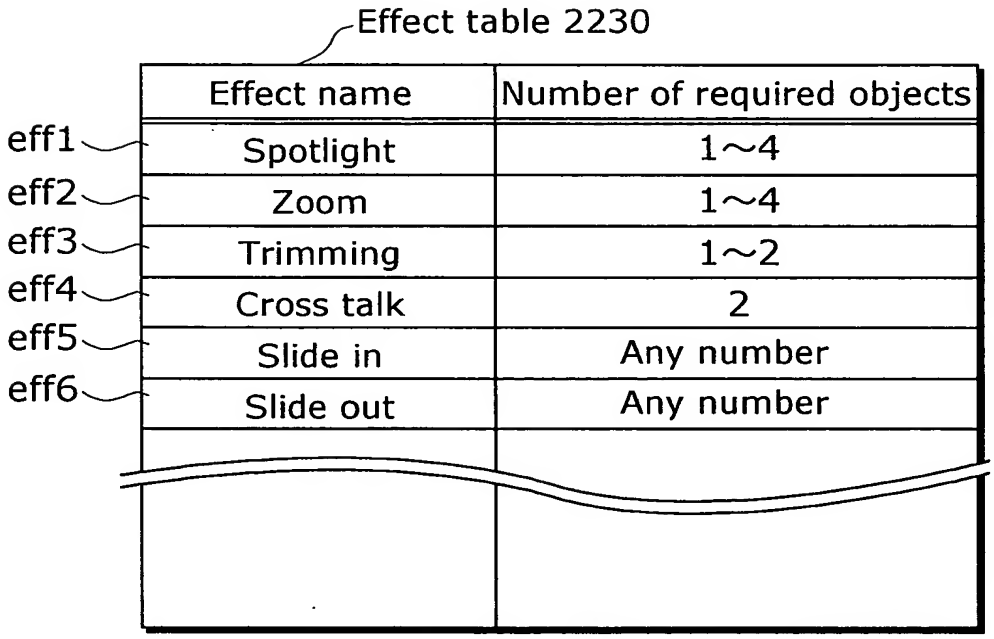

Effect table 2230
Effect name
Number of required objects
eff1
Spotlight
1~4
eff2
Zoom
1~4
eff3
Trimming
1~2
eff4
Cross talk
2
eff5
Slide in
Any number
eff6
Slide out
Any number

Fig.20

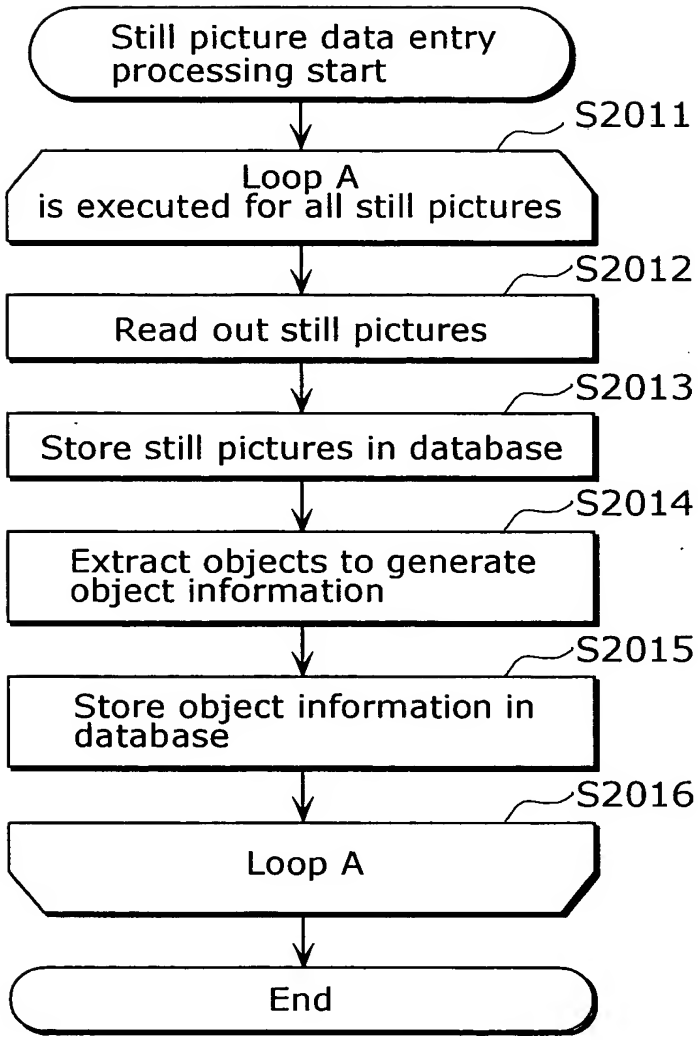

Still picture data entry processing start
S2011
Loop A is executed for all still pictures
S2012
Read out still pictures
S2013
Store still pictures in database
S2014
Extract objects to generate object information
S2015
Store object information in database
S2016
Loop A
End

Fig.21

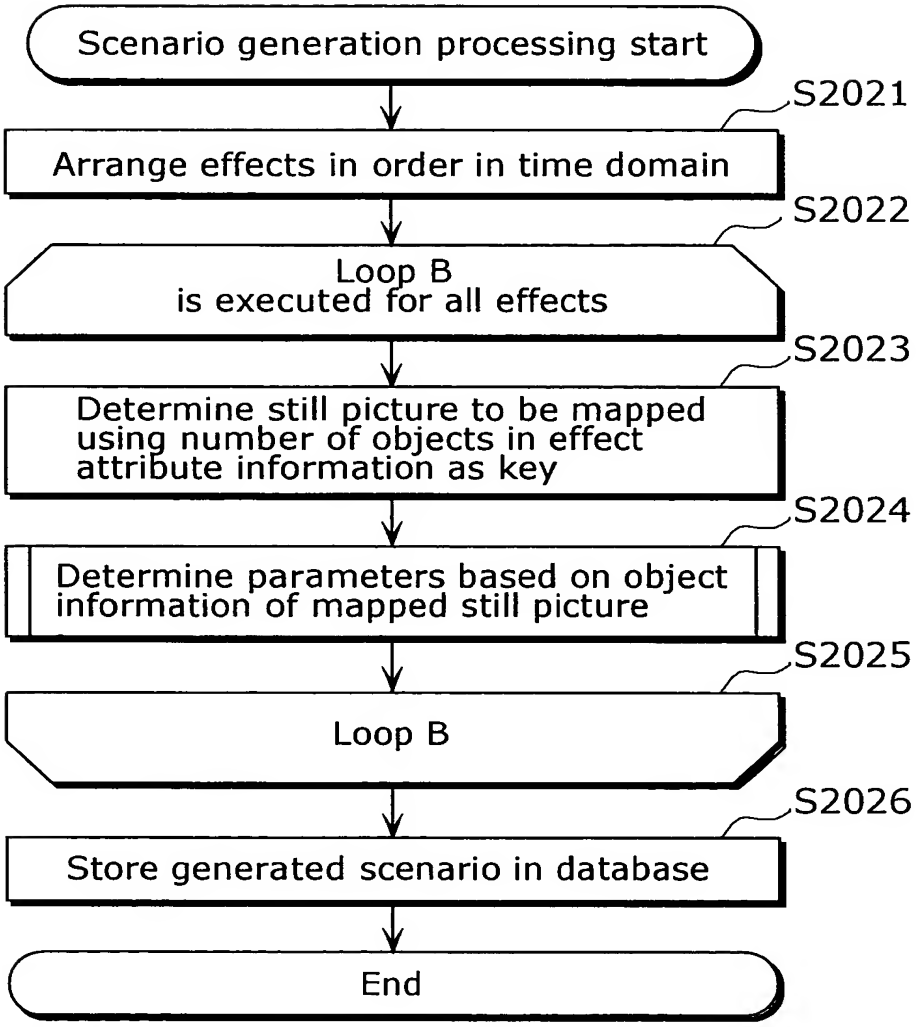

Scenario generation processing start
S2021
Arrange effects in order in time domain
S2022
Loop B
is executed for all effects
S2023
Determine still picture to be mapped using number of objects in effect attribute information as key
S2024
Determine parameters based on object information of mapped still picture
S2025
Loop B
S2026
Store generated scenario in database
End

Fig.22

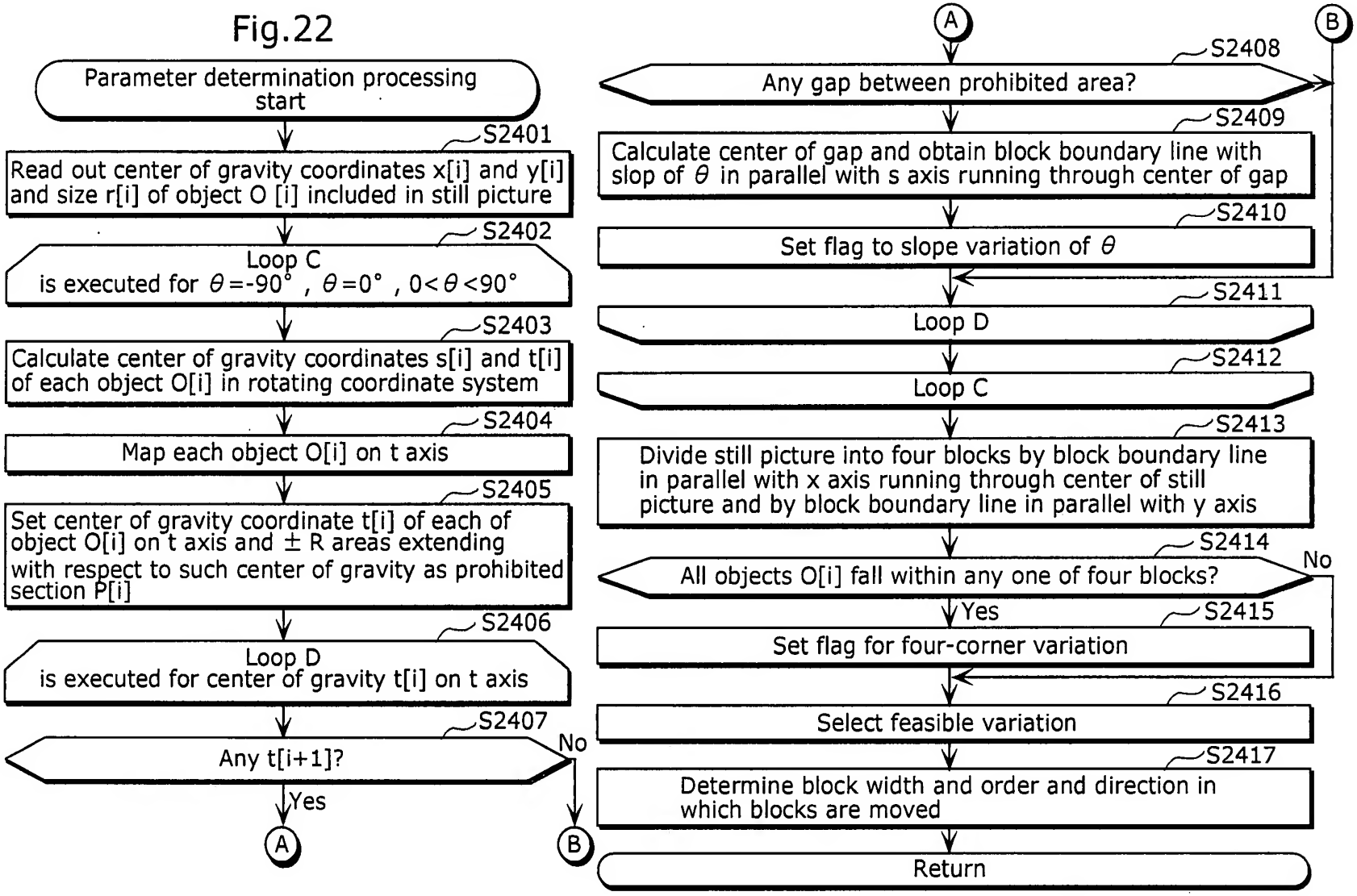

Parameter determination processing start
S2401
Read out center of gravity coordinates x[i] and y[i] and size r[i] of object O [i] included in still picture
S2402
Loop C
is executed for θ=-90° , θ=0° , 0<θ<90°
S2403
Calculate center of gravity coordinates s[i] and t[i] of each object O[i] in rotating coordinate system
S2404
Map each object O[i] on t axis
S2405
Set center of gravity coordinate t[i] of each of object O[i] on t axis and ± R areas extending with respect to such center of gravity as prohibited section P[i]
S2406
Loop D
is executed for center of gravity t[i] on t axis
S2407
Any t[i+1]?
No
Yes
A
B
A
B
S2408
Any gap between prohibited area?
S2409
Calculate center of gap and obtain block boundary line with slop of θ in parallel with s axis running through center of gap
S2410
Set flag to slope variation of θ
S2411
Loop D
S2412
Loop C
S2413
Divide still picture into four blocks by block boundary line in parallel with x axis running through center of still picture and by block boundary line in parallel with y axis
S2414
All objects O[i] fall within any one of four blocks?
No
Yes
S2415
Set flag for four-corner variation
S2416
Select feasible variation
S2417
Determine block width and order and direction in which blocks are moved
Return

Fig.23A

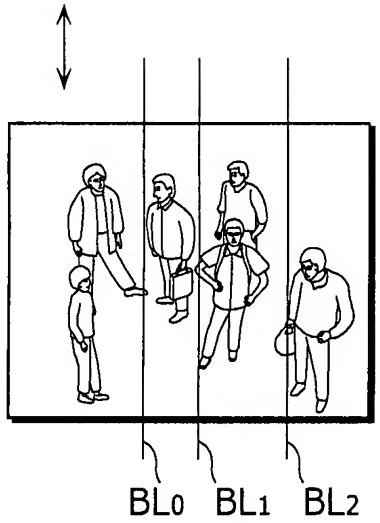


Fig.23B

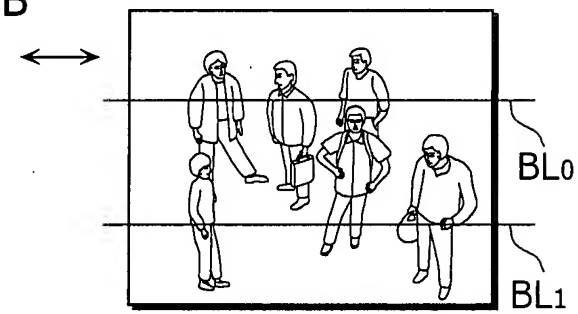


Fig.23C

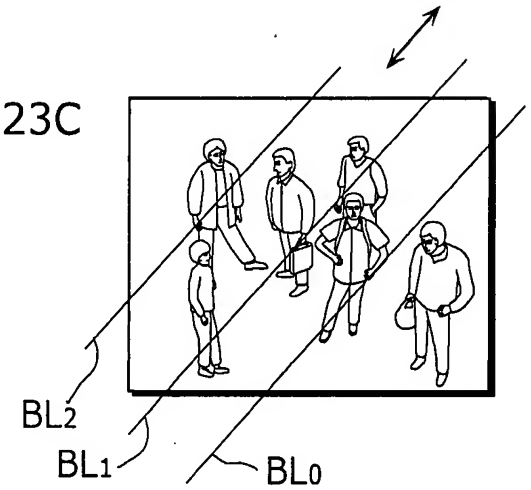
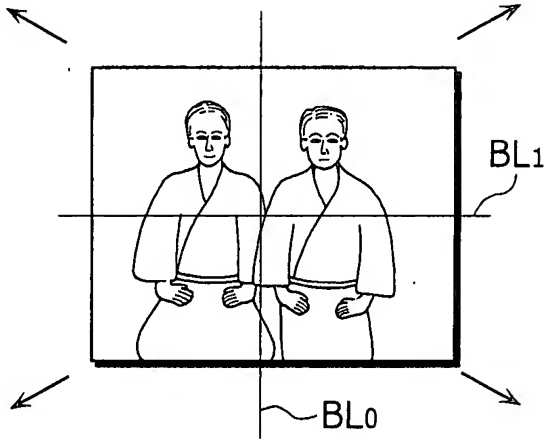


Fig.23D



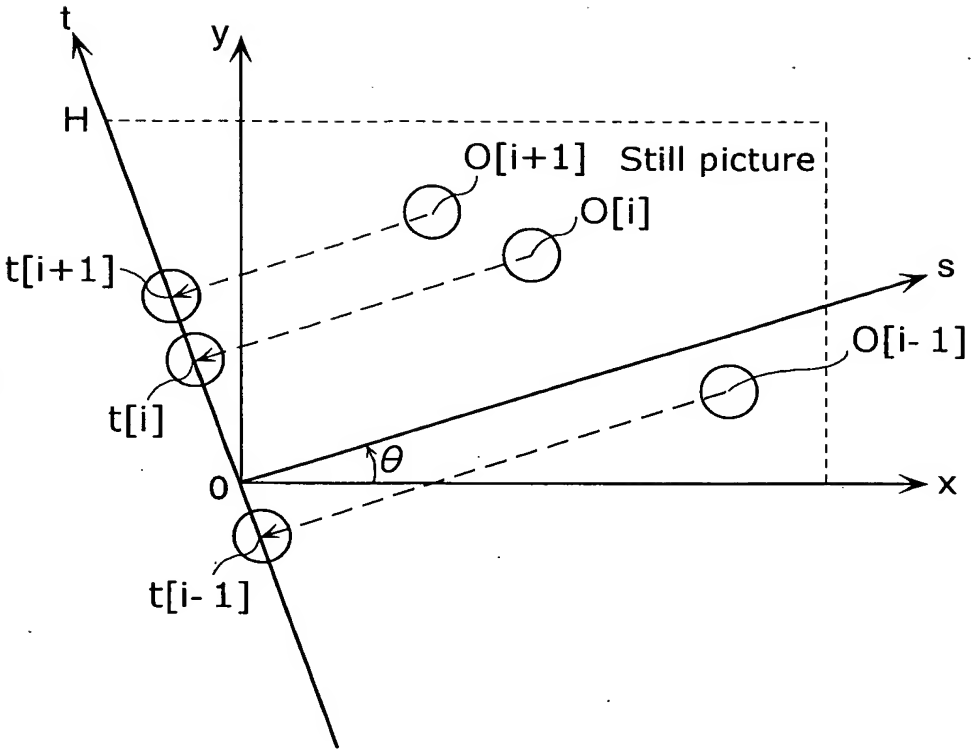


Fig.24A

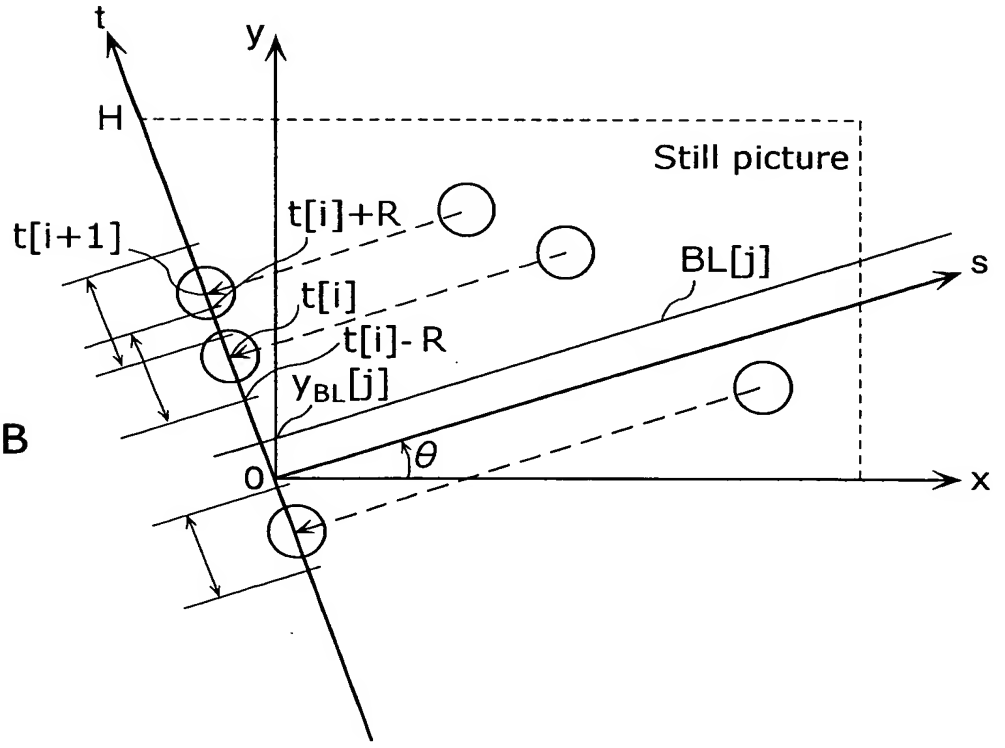


Fig.24B

Fig.25

Scenario2270

Starting time	0 second	2 seconds	3 seconds	···
End time	2 seconds	3 seconds	5 seconds	···
Effect	Slide out	Zoom	Slide in	···
Still picture	A	B	C	···
Parameters	Variation: slanting: FO=1, θ --- 1. Size (width of blocks to be slide out) BO: position of block boundary yBL[j], θ ··· --- 2. Order (order of sliding out blocks) B0, B1, ··· --- 3. Direction (direction in which blocks are slide out) B0: toward upper right B1: toward lower right ···	O0(x0, y0) r0	···	···

Fig.26

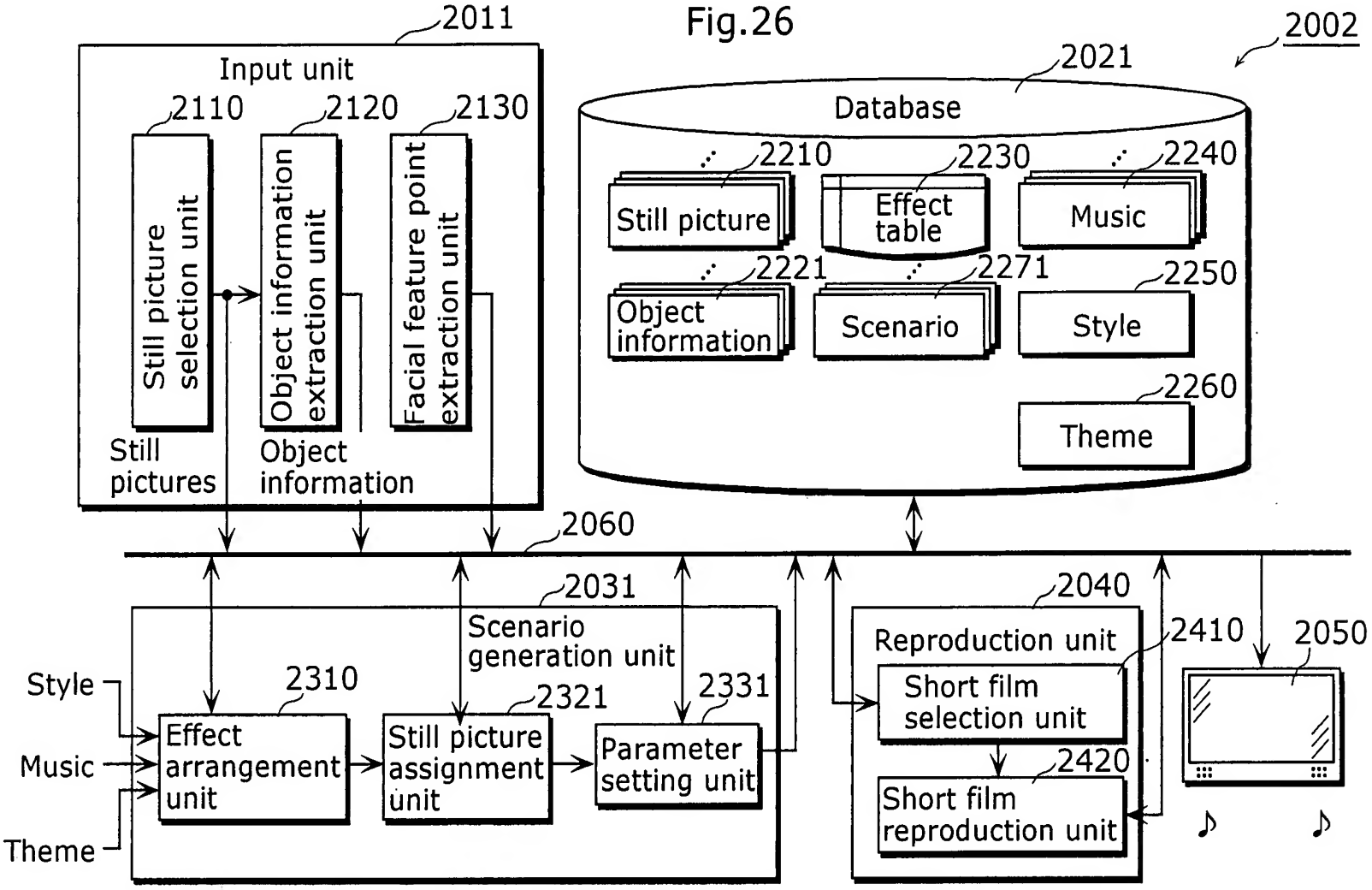

2011
Input unit
2110
2120
2130
Still picture selection unit
Object information extraction unit
Facial feature point extraction unit
Still pictures
Object information
2002
2021
Database
2210
2230
2240
Still picture
Effect table
Music
2221
2271
2250
Object information
Scenario
Style
2260
Theme
2060
2031
Scenario generation unit
2040
Reproduction unit
2410
2050
Style
Music
Theme
2310
2321
2331
Effect arrangement unit
Still picture assignment unit
Parameter setting unit
Short film selection unit
2420
Short film reproduction unit

Fig.27A

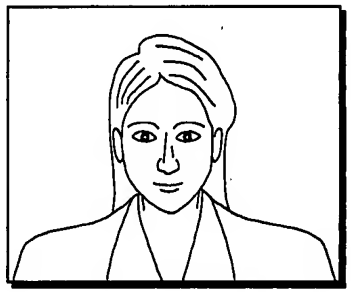


Fig.27B

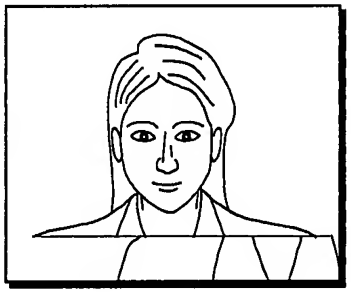


Fig.27C

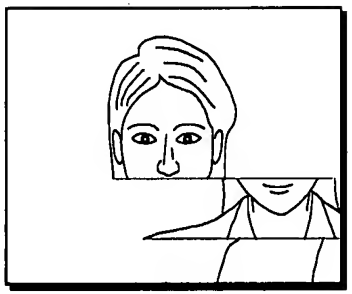


Fig.27D

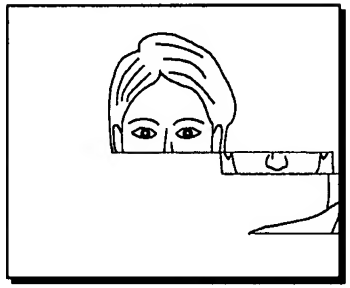


Fig.27E

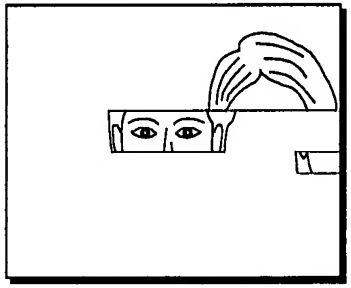


Fig.27F

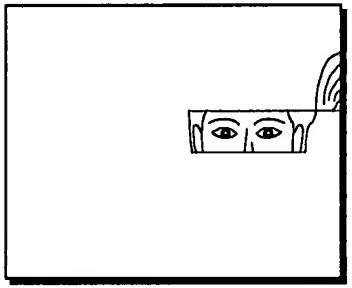


Fig.27G

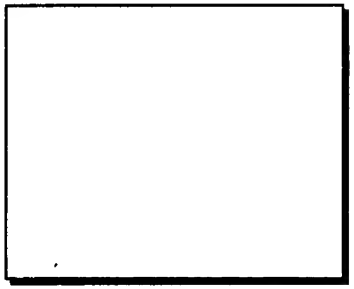


Fig.28

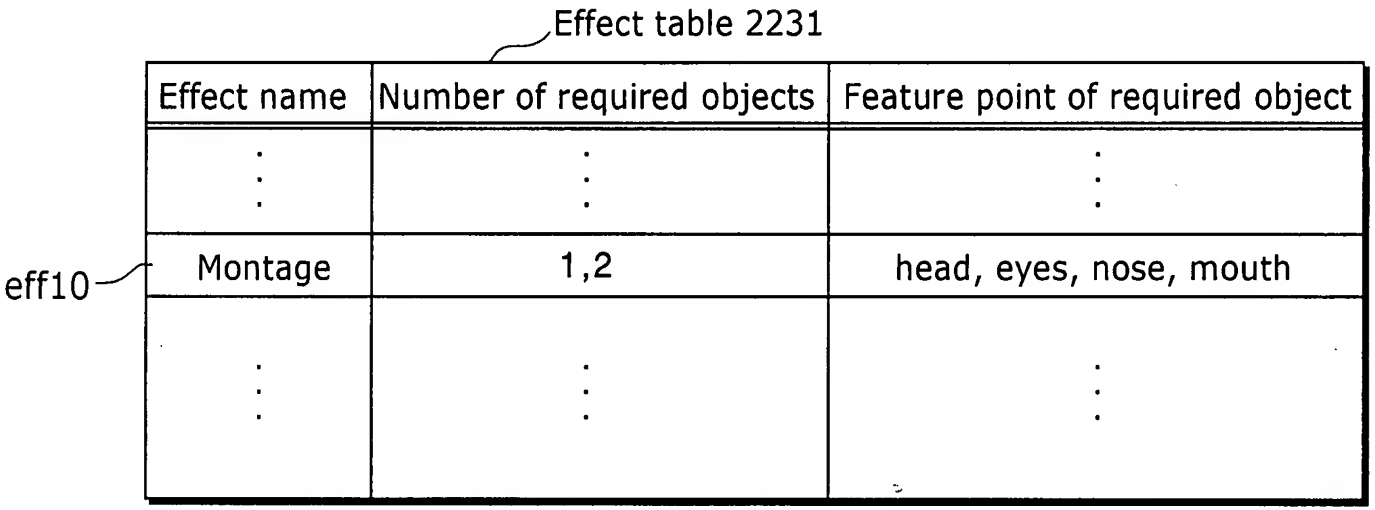

Effect table 2231
Effect name
Number of required objects
Feature point of required object
eff10
Montage
1,2
head, eyes, nose, mouth

Fig.29

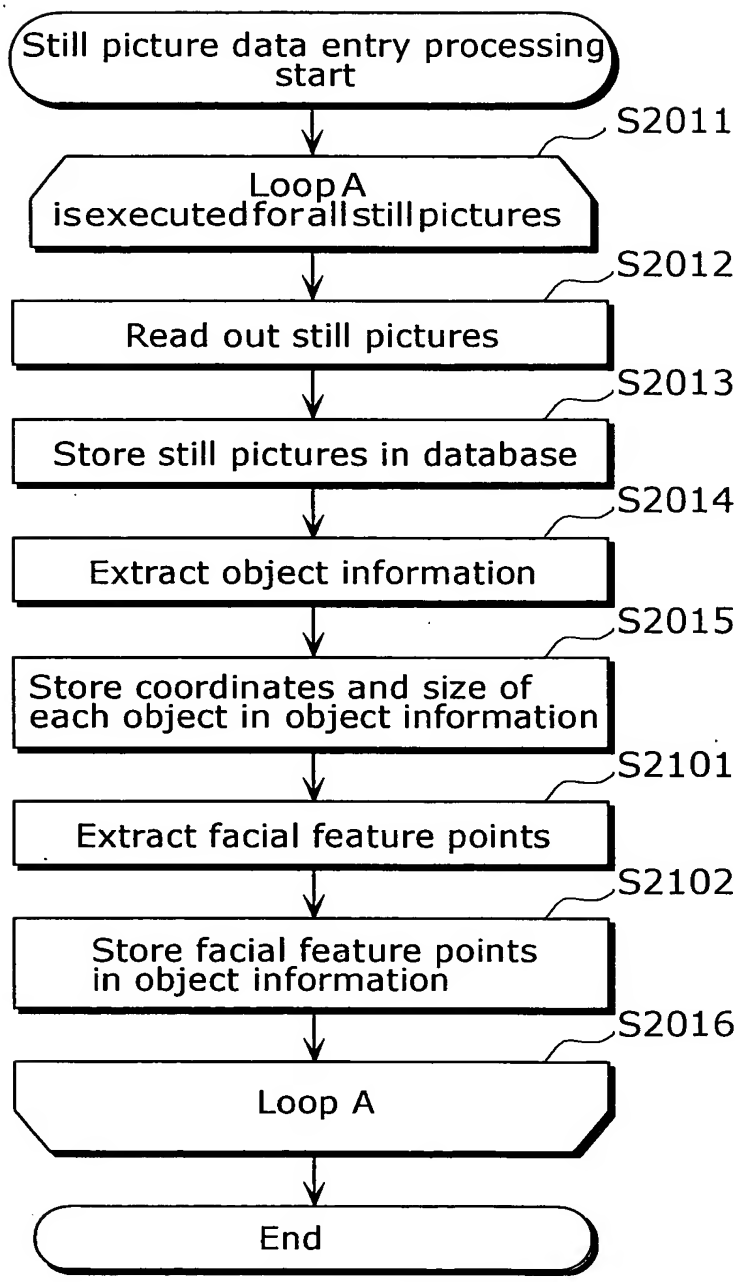

Still picture data entry processing start
S2011
Loop A is executed for all still pictures
S2012
Read out still pictures
S2013
Store still pictures in database
S2014
Extract object information
S2015
Store coordinates and size of each object in object information
S2101
Extract facial feature points
S2102
Store facial feature points in object information
S2016
Loop A
End

Fig.30

Object information 2221

File name of still picture					b001. jpg
Center coordinates of object					O0:(x0, y0)
Size of object					r0
Feature points	Eyes	Left	Inner corner		Oels0:(xels0, yels0)
			Outer corner		Oels0:(xels0, yels0)
		Right	Inner corner		Oers0:(xers0, yers0)
			Outer corner		Oers0:(xers0, yers0)
	Top of nose				On0:(xn0, yn0)
	Edges of mouth				Oml0:(xml0, yml0), Omr0:(xmr0, ymr0)
	Edges of eye brows				...
	⋮				⋮

Fig.31

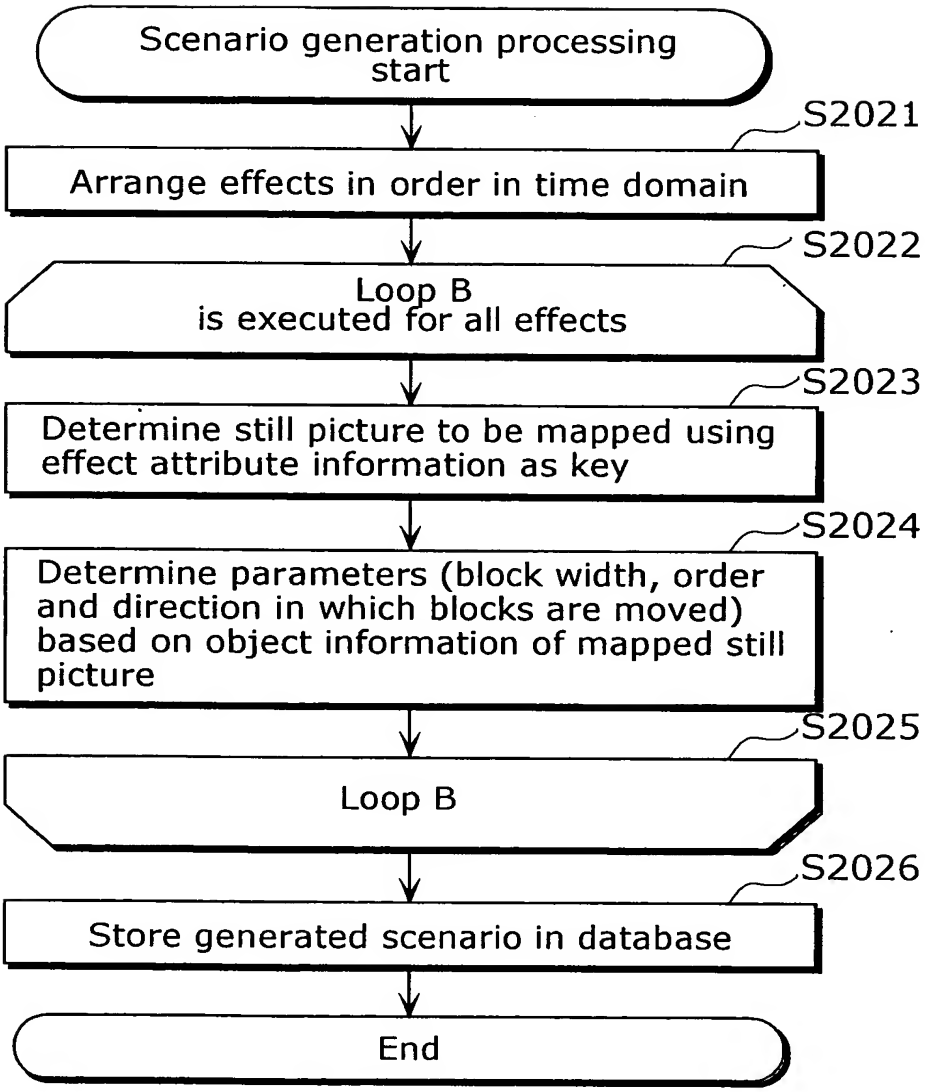

Scenario generation processing start
S2021
Arrange effects in order in time domain
S2022
Loop B
is executed for all effects
S2023
Determine still picture to be mapped using effect attribute information as key
S2024
Determine parameters (block width, order and direction in which blocks are moved) based on object information of mapped still picture
S2025
Loop B
S2026
Store generated scenario in database
End

Fig.32

Scenario 2271

Starting time	0 second	...
End time	2 seconds	...
Effect	Montage	...
Still picture	b001. jpg	...
Parameters	1. Size (width of blocks to be slide out)	...
	2. Order (order of sliding out blocks) 1. Blocks other than face 2. Block including mouth 3. Block including head 4. Block including eyes	
	3. Direction (direction in which blocks are slide out) Random	

Fig.33A

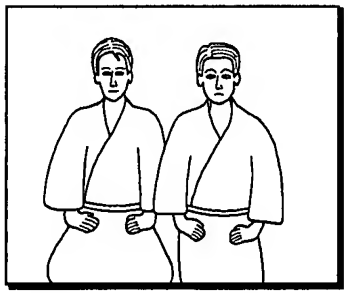


Fig.33B

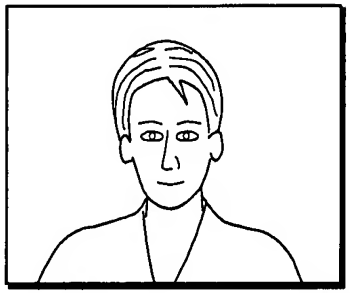


Fig.33C

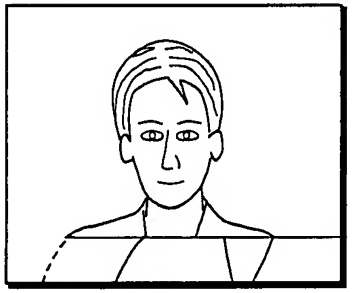


Fig.33D

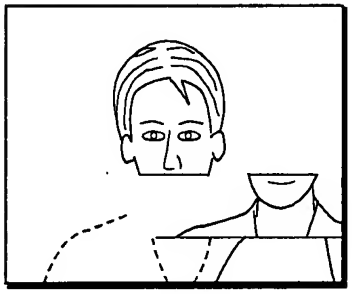


Fig.33E

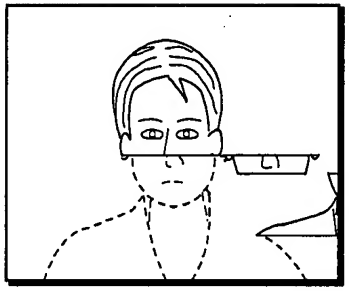


Fig.33F

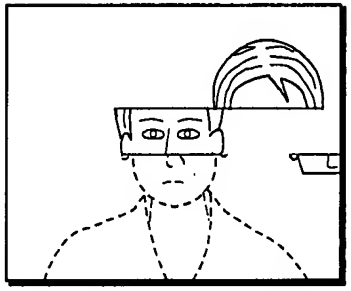


Fig.33G

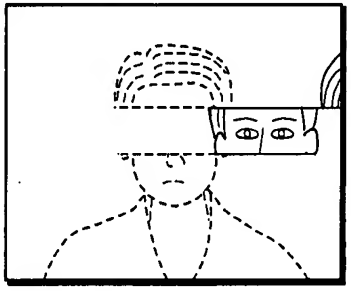


Fig.33H

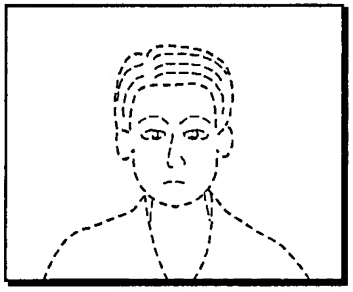


Fig.34

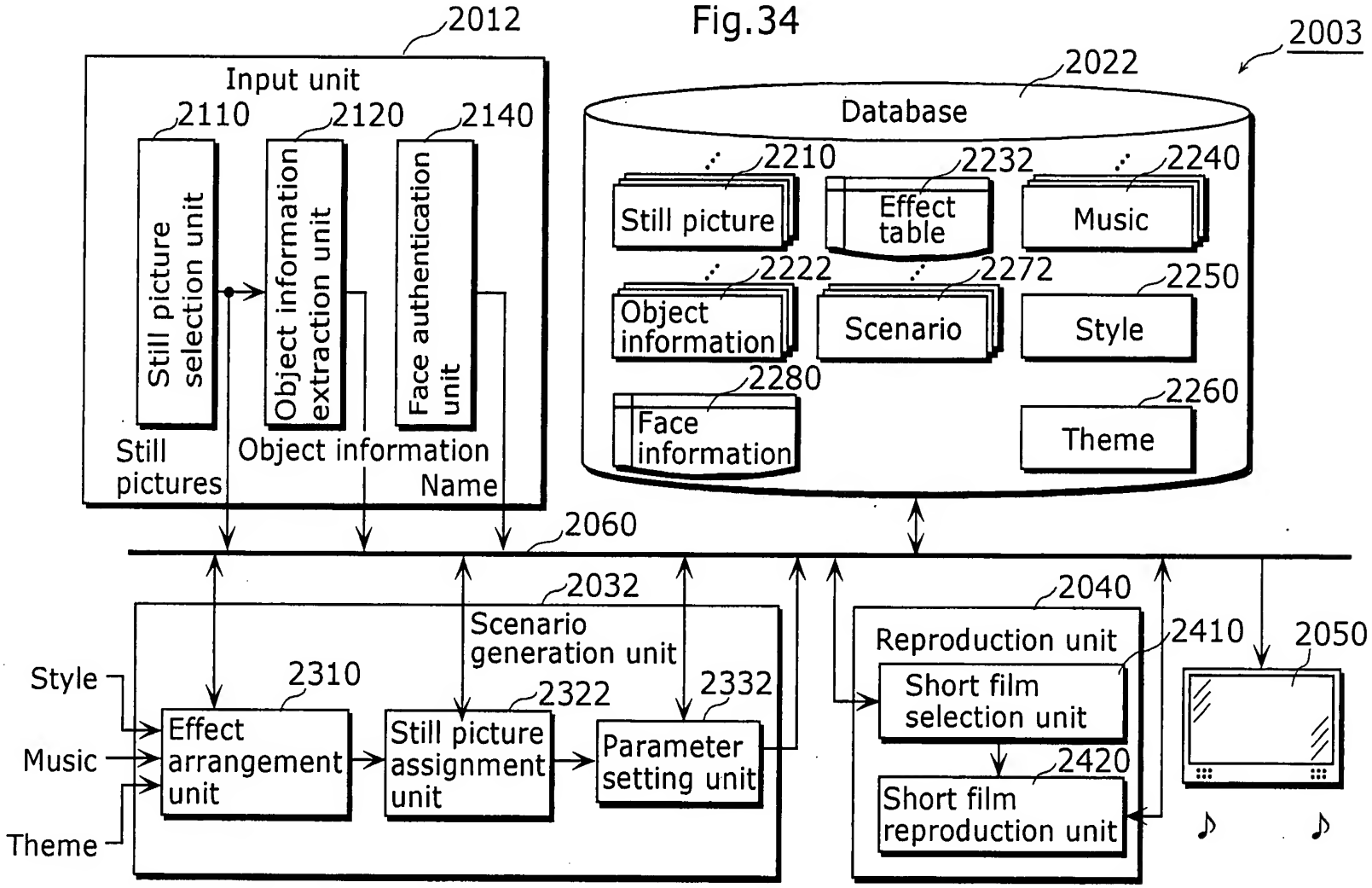

2012
Input unit
2110
2120
2140
Still picture selection unit
Object information extraction unit
Face authentication unit
Still pictures
Object information
Name
2003
2022
Database
2210
2232
2240
Still picture
Effect table
Music
2222
2272
2250
Object information
Scenario
Style
2280
2260
Face information
Theme
2060
2032
Scenario generation unit
2040
Reproduction unit
2410
2050
Style
2310
2322
2332
Music
Effect arrangement unit
Still picture assignment unit
Parameter setting unit
Short film selection unit
2420
Theme
Short film reproduction unit

Fig.35

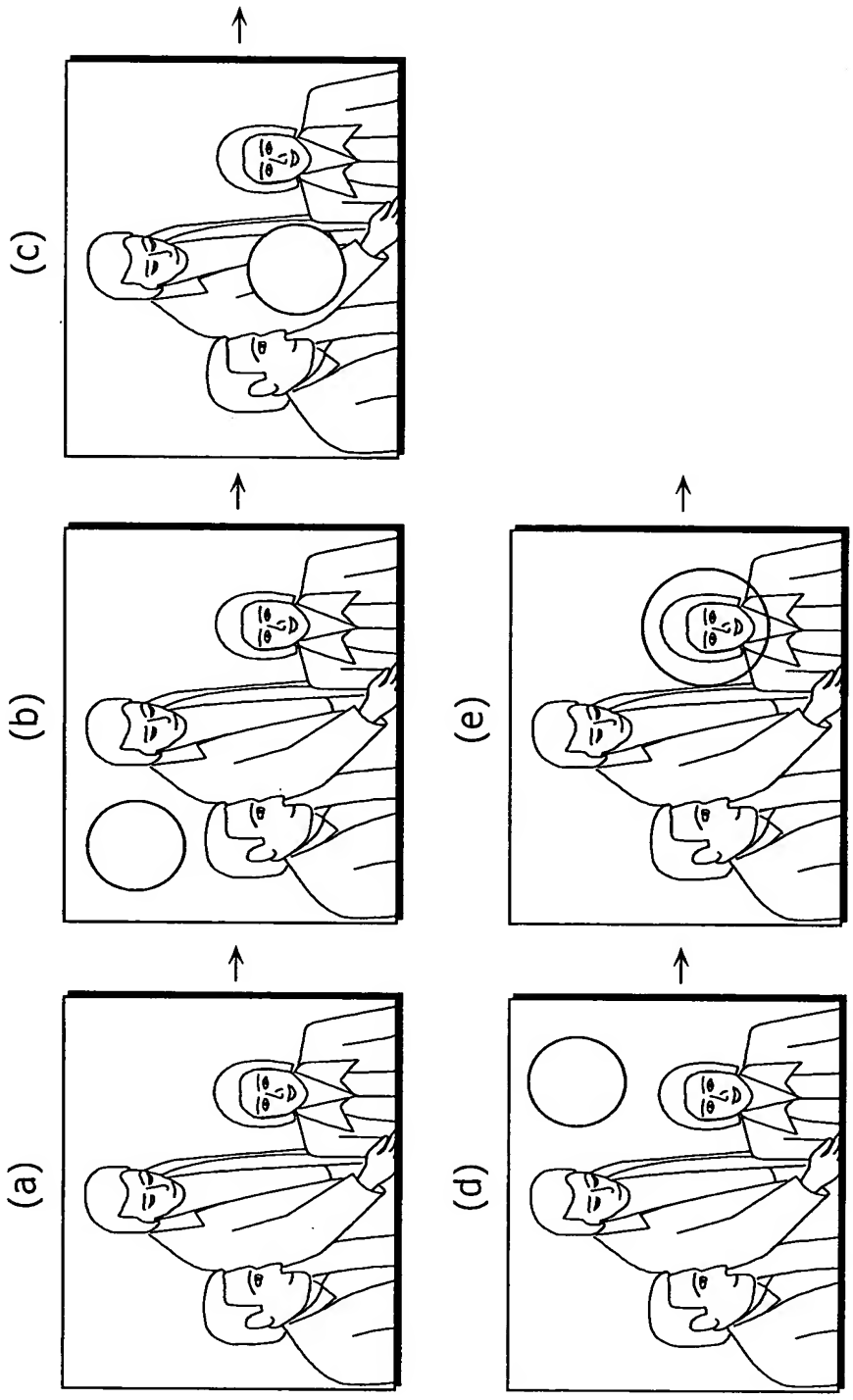


Fig.36

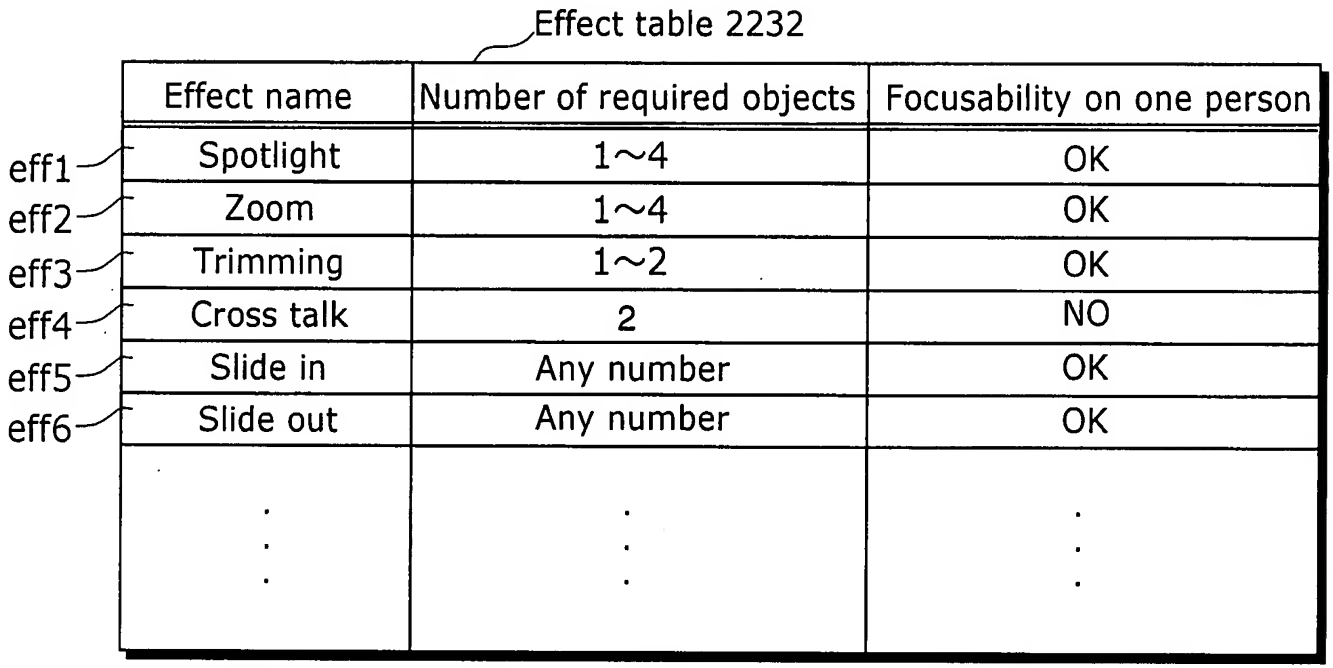

Effect table 2232
Effect name
Number of required objects
Focusability on one person
eff1
Spotlight
1~4
OK
eff2
Zoom
1~4
OK
eff3
Trimming
1~2
OK
eff4
Cross talk
2
NO
eff5
Slide in
Any number
OK
eff6
Slide out
Any number
OK

Fig.37

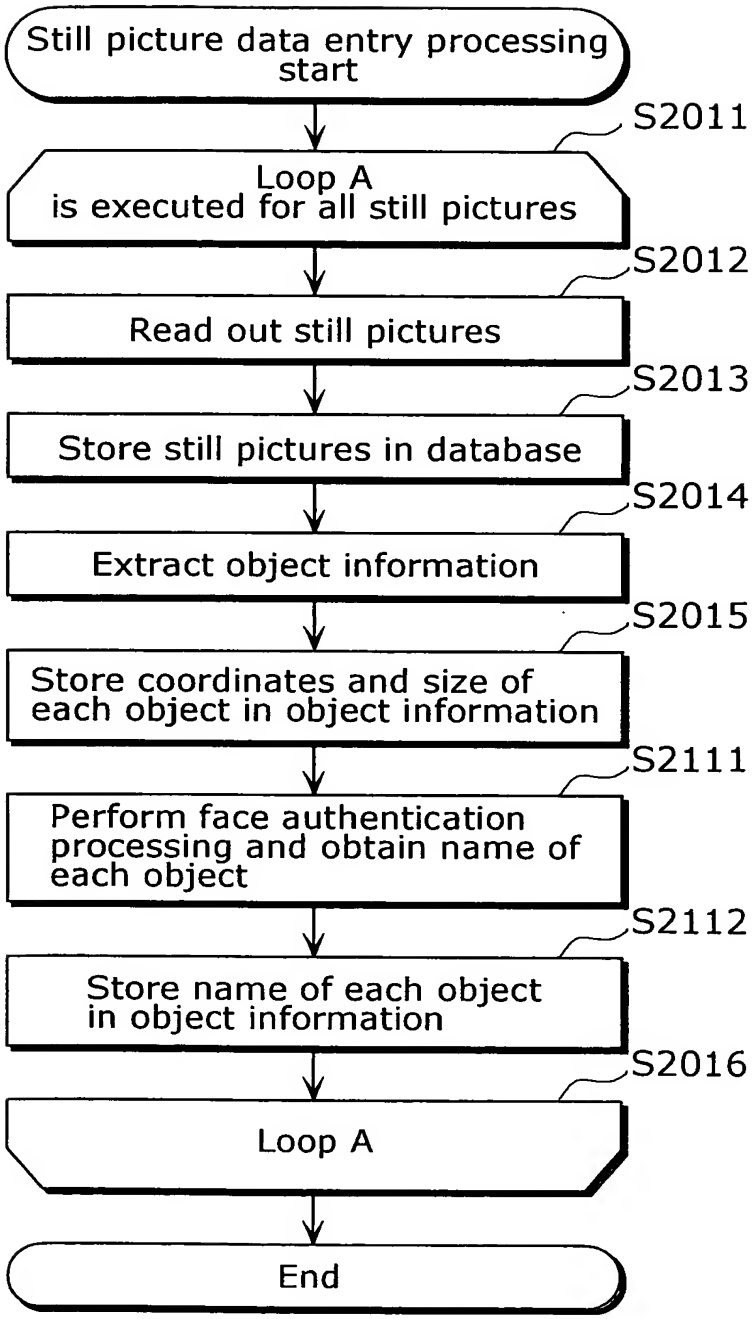

Still picture data entry processing start
S2011
Loop A is executed for all still pictures
S2012
Read out still pictures
S2013
Store still pictures in database
S2014
Extract object information
S2015
Store coordinates and size of each object in object information
S2111
Perform face authentication processing and obtain name of each object
S2112
Store name of each object in object information
S2016
Loop A
End

Fig.38

Object information 2222

File name	c001.jpg		
Center coordinates of object	00:(x0, y0)	01:(x1, y1)	02:(x2, y2)
Size of object	r0	r1	r2
Name of object	Stewart	Nash	Nikita

Fig.39

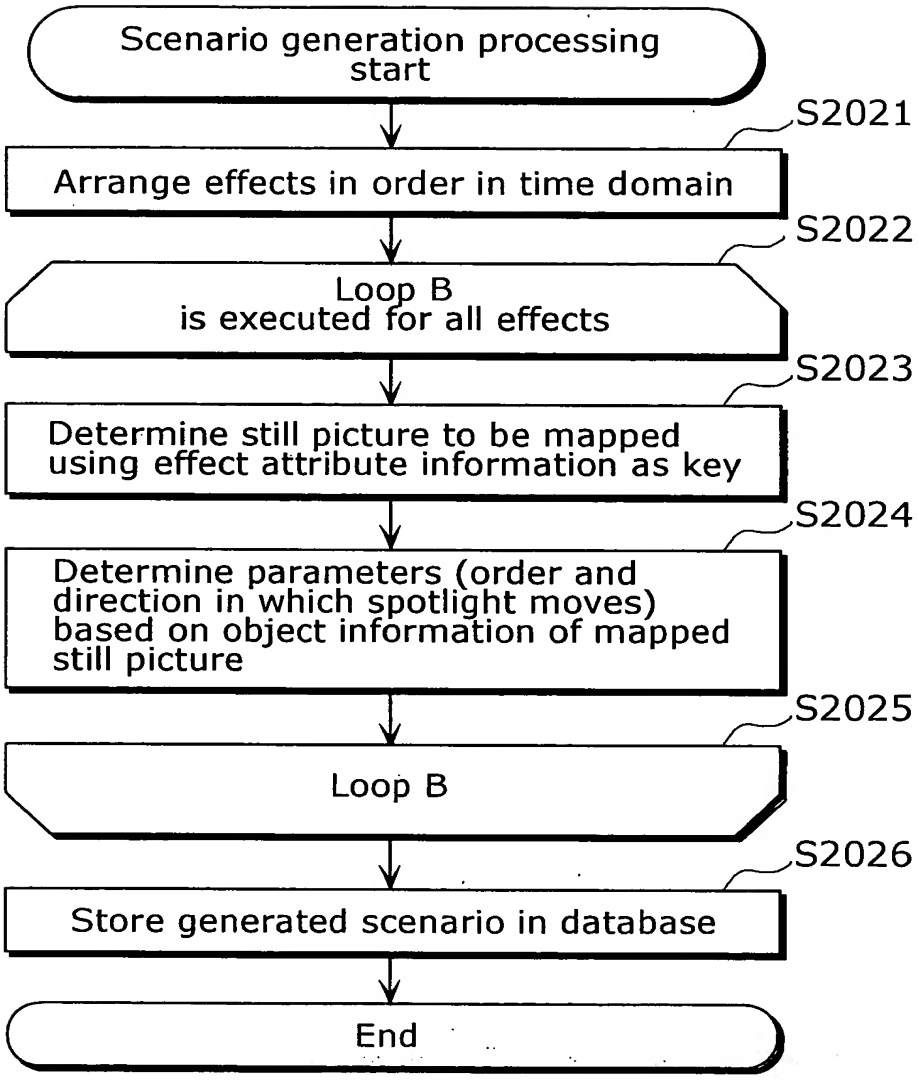

Scenario generation processing start
S2021
Arrange effects in order in time domain
S2022
Loop B
is executed for all effects
S2023
Determine still picture to be mapped using effect attribute information as key
S2024
Determine parameters (order and direction in which spotlight moves) based on object information of mapped still picture
S2025
Loop B
S2026
Store generated scenario in database
End

Fig.40

Scenario 2272

Starting time	0 second	...
End time	2 seconds	...
Effect	Spotlight	...
Still picture	c001.jpg	...
Parameter	Object to put spotlight on Nikita	...

Fig.41

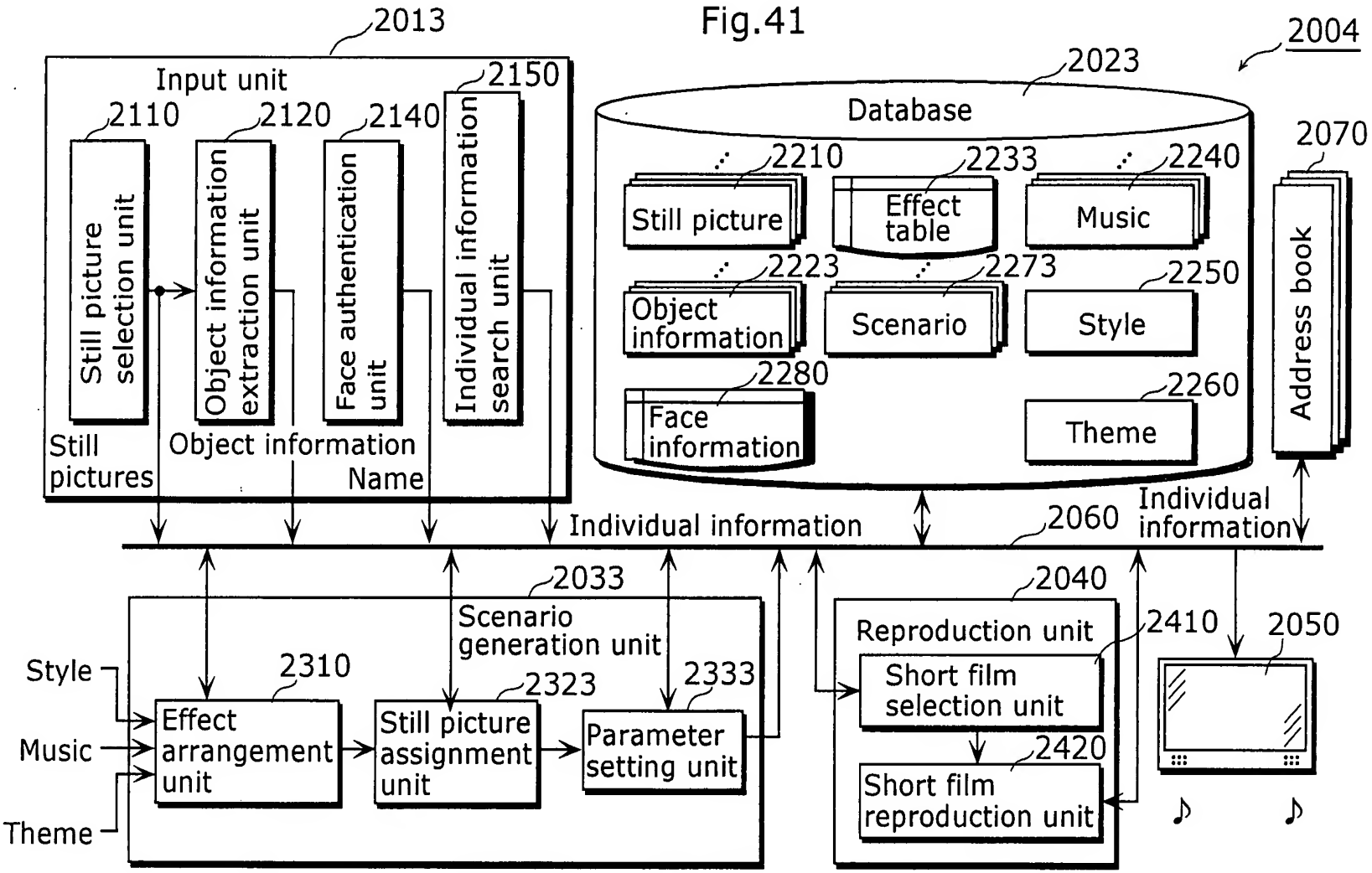

2013
Input unit
2110
2120
2140
2150
Still picture selection unit
Object information extraction unit
Face authentication unit
Individual information search unit
Still pictures
Object information
Name
2004
2023
Database
2210
2233
2240
Still picture
Effect table
Music
2223
2273
2250
Object information
Scenario
Style
2280
2260
Face information
Theme
2070
Address book
Individual information
2060
Individual information
2033
Scenario generation unit
2040
Reproduction unit
2410
2050
Style
Music
Theme
2310
2323
2333
Effect arrangement unit
Still picture assignment unit
Parameter setting unit
Short film selection unit
2420
Short film reproduction unit

Fig.42

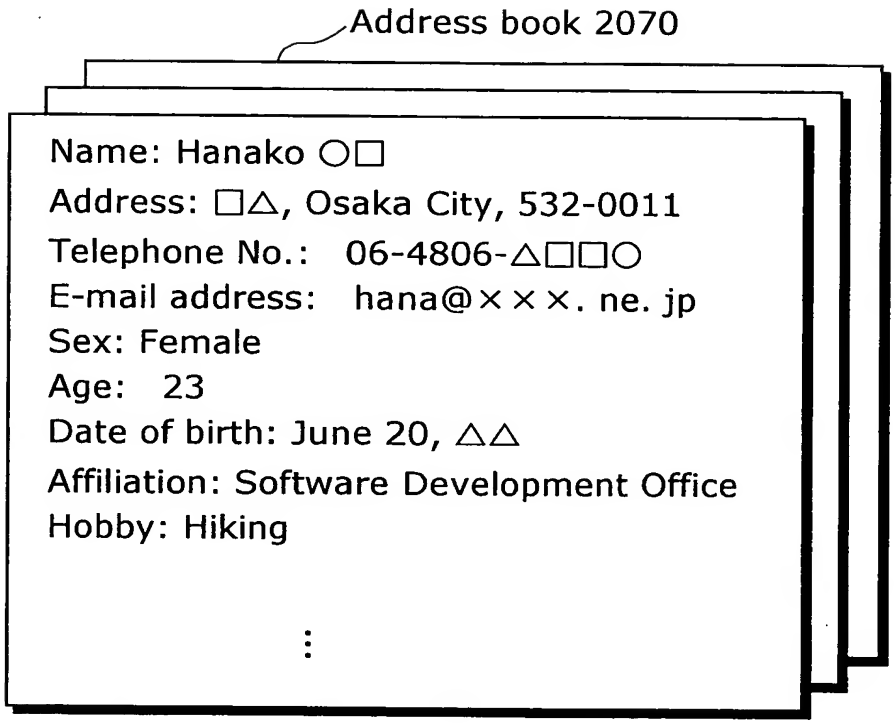

Address book 2070
Name: Hanako ○□
Address: □△, Osaka City, 532-0011
Telephone No.: 06-4806-△□□○
E-mail address: hana@×××. ne. jp
Sex: Female
Age: 23
Date of birth: June 20, △△
Affiliation: Software Development Office
Hobby: Hiking

Fig.43A

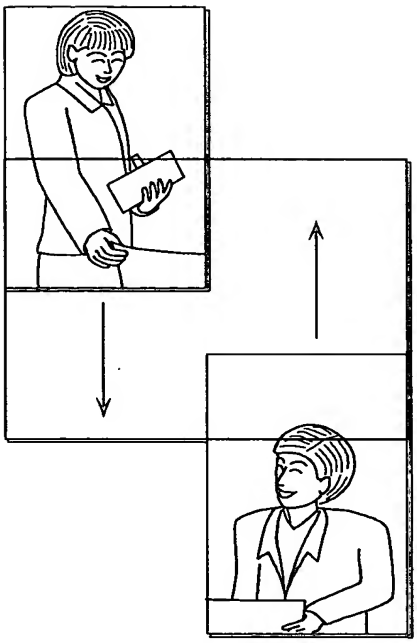


Fig.43B

Fig.43C

Fig.43D

Fig.44A

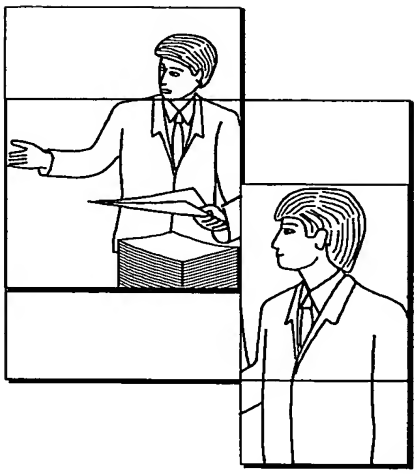


Fig.44B

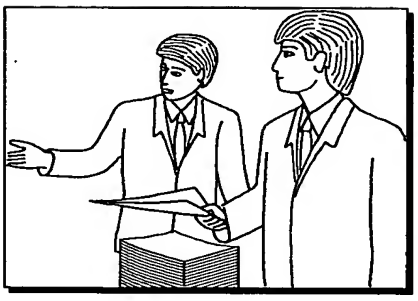


Fig.44C

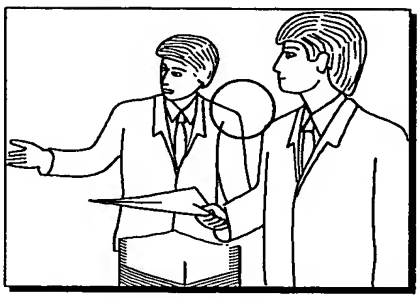


Fig.44D

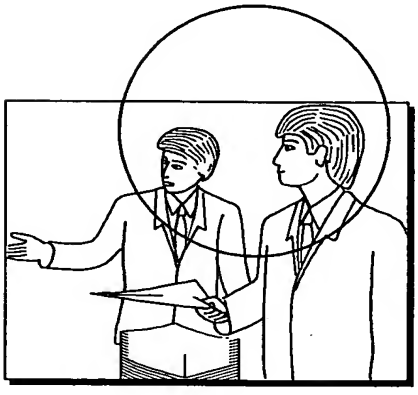


Fig.45

Effect table 2233

	Effect name	Number of required objects	Sex of required objects	Character
	⋮	⋮	⋮	⋮
eff5	Side in	2	1 man and 1 woman	Heart mark
			Other combination possible	○
eff6	Slide out	2	1 man and 1 woman	Heart mark
			Other combination possible	○
	⋮	⋮	⋮	⋮

Fig.46

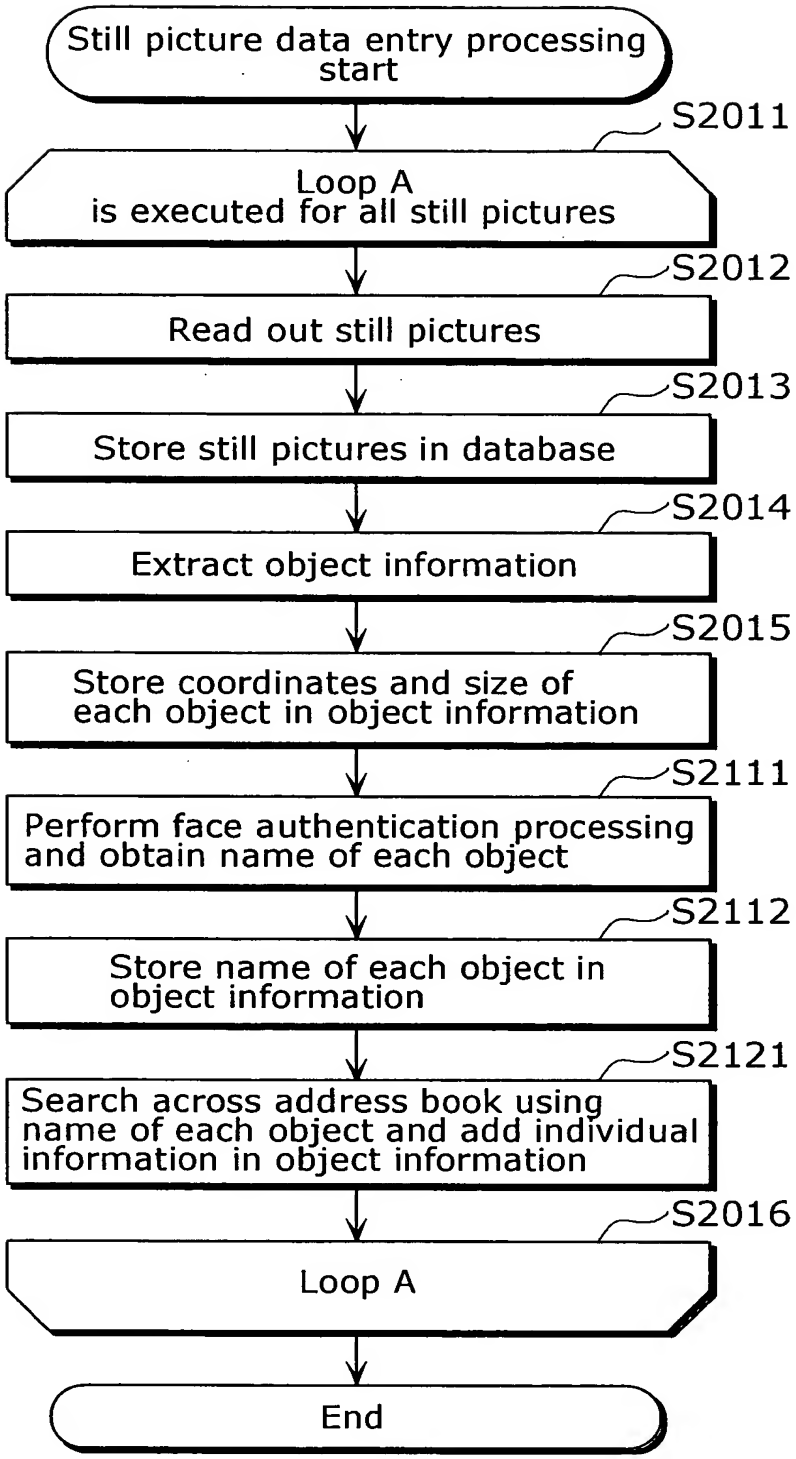

Still picture data entry processing start
S2011
Loop A is executed for all still pictures
S2012
Read out still pictures
S2013
Store still pictures in database
S2014
Extract object information
S2015
Store coordinates and size of each object in object information
S2111
Perform face authentication processing and obtain name of each object
S2112
Store name of each object in object information
S2121
Search across address book using name of each object and add individual information in object information
S2016
Loop A
End

Fig.47

Object information 2223

File name		b001. jpg	
Center coordinates of object		O0:(x0, y0)	O1:(x1, y1)
Size of object		r0	r1
Name of object		Hanako ○△	Taro □×
Object attributes	Sex	Female	Male
	Age	23	26
	Date of birth	June 20, △△	August 10, ○○
	Affiliation	Software Development Office	Intellectual Property Management Office
	Hobby	Hiking	Cycling

Fig.48

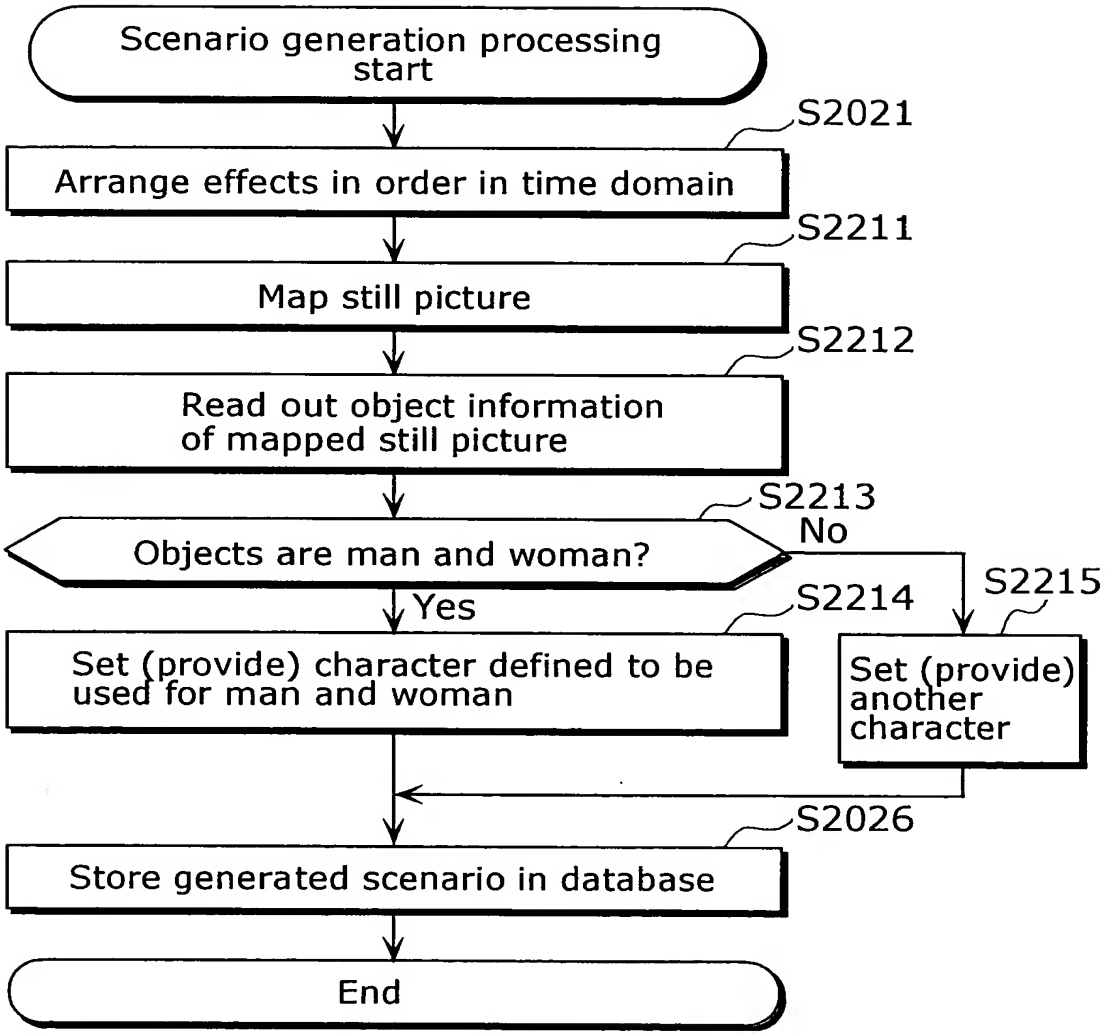

Scenario generation processing start
S2021
Arrange effects in order in time domain
S2211
Map still picture
S2212
Read out object information of mapped still picture
S2213
Objects are man and woman?
No
Yes
S2214
Set (provide) character defined to be used for man and woman
S2215
Set (provide) another character
S2026
Store generated scenario in database
End

Fig.49

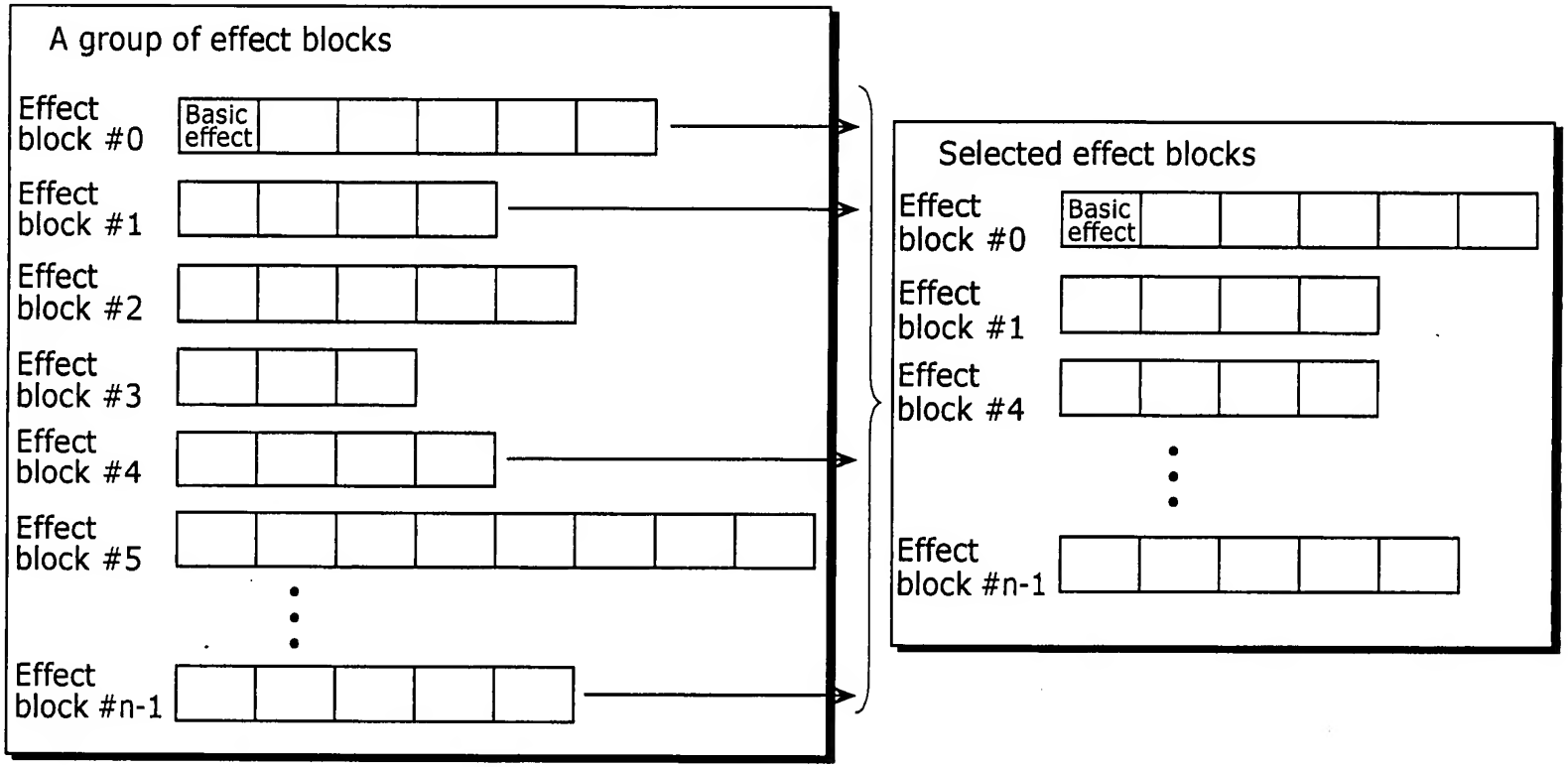

A group of effect blocks
Effect block #0
Basic effect
Effect block #1
Effect block #2
Effect block #3
Effect block #4
Effect block #5
Effect block #n-1
Selected effect blocks
Effect block #0
Basic effect
Effect block #1
Effect block #4
Effect block #n-1

Fig.50

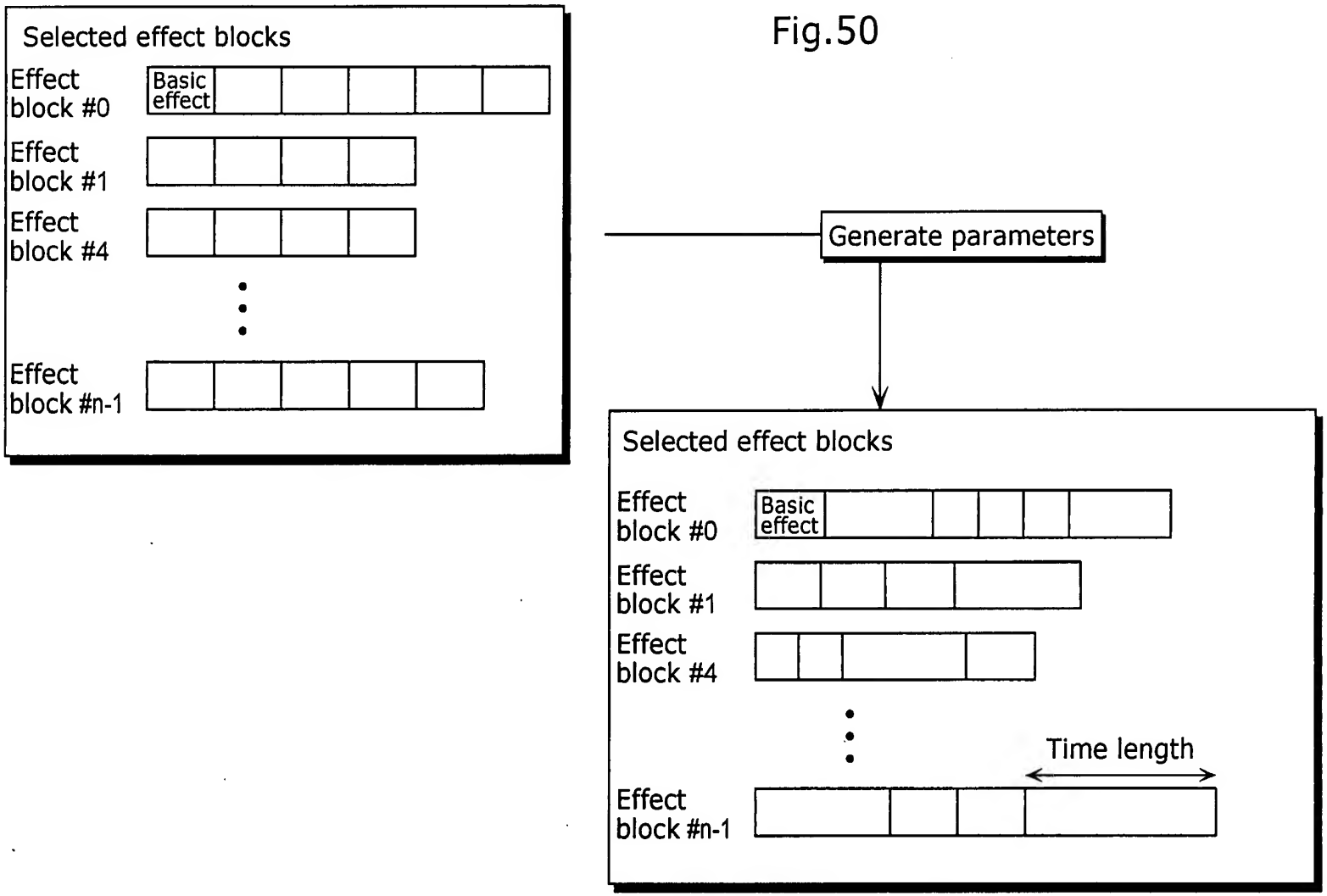

Selected effect blocks
Effect block #0
Basic effect
Effect block #1
Effect block #4
Effect block #n-1
Generate parameters
Selected effect blocks
Effect block #0
Basic effect
Effect block #1
Effect block #4
Time length
Effect block #n-1

Fig.51

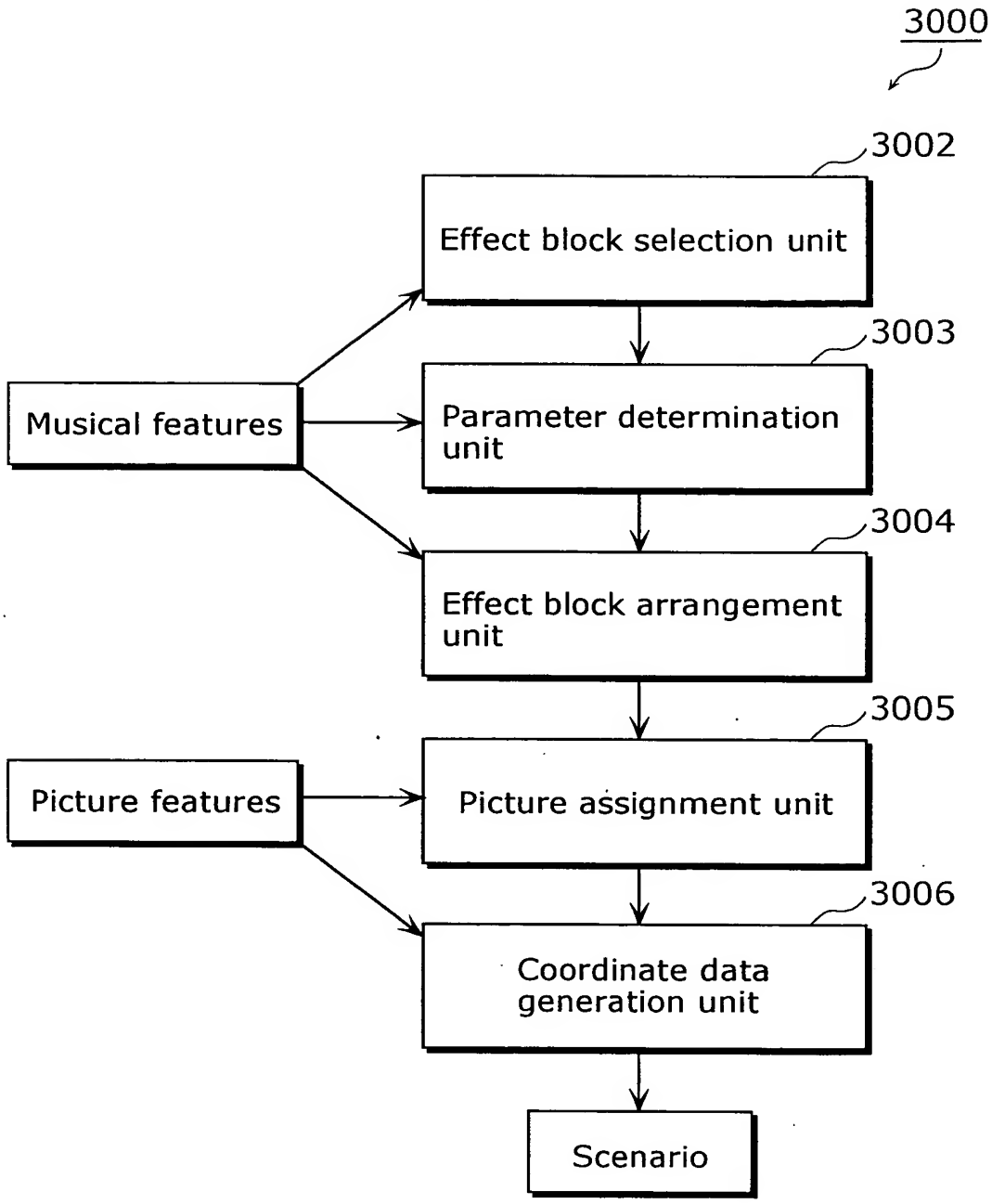

3000
3002
Effect block selection unit
3003
Parameter determination unit
3004
Effect block arrangement unit
3005
Picture assignment unit
3006
Coordinate data generation unit
Scenario
Musical features
Picture features

Fig.52

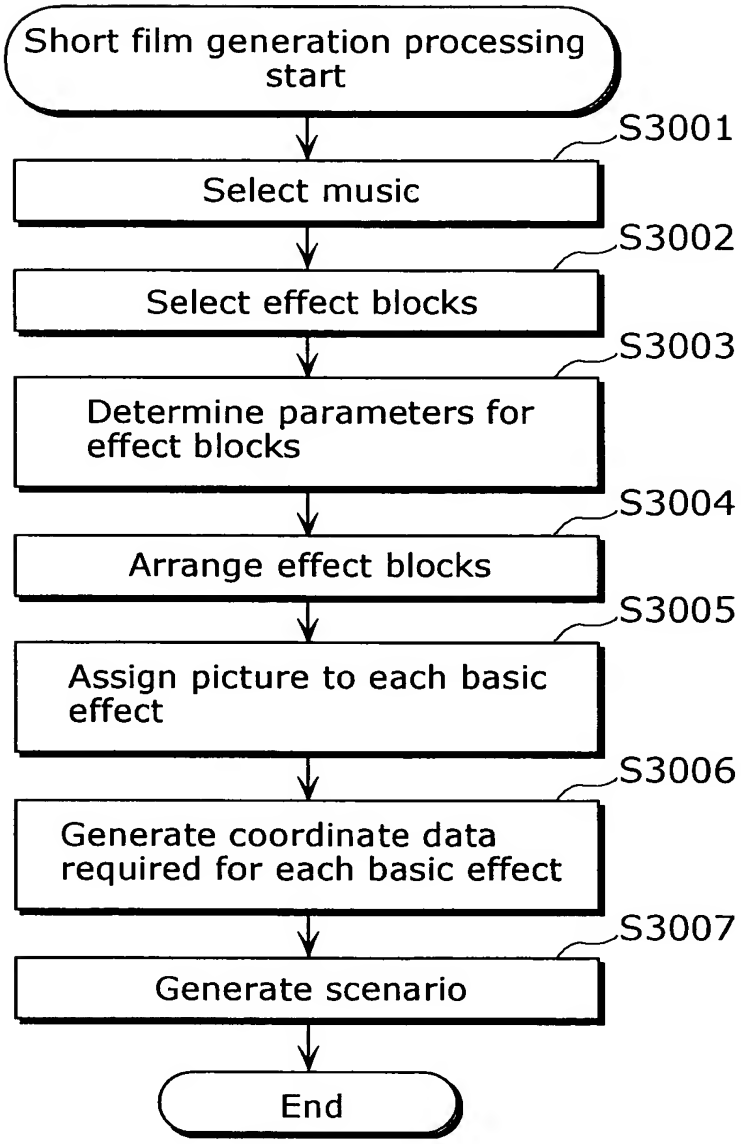

Short film generation processing start
S3001
Select music
S3002
Select effect blocks
S3003
Determine parameters for effect blocks
S3004
Arrange effect blocks
S3005
Assign picture to each basic effect
S3006
Generate coordinate data required for each basic effect
S3007
Generate scenario
End

Fig.53A

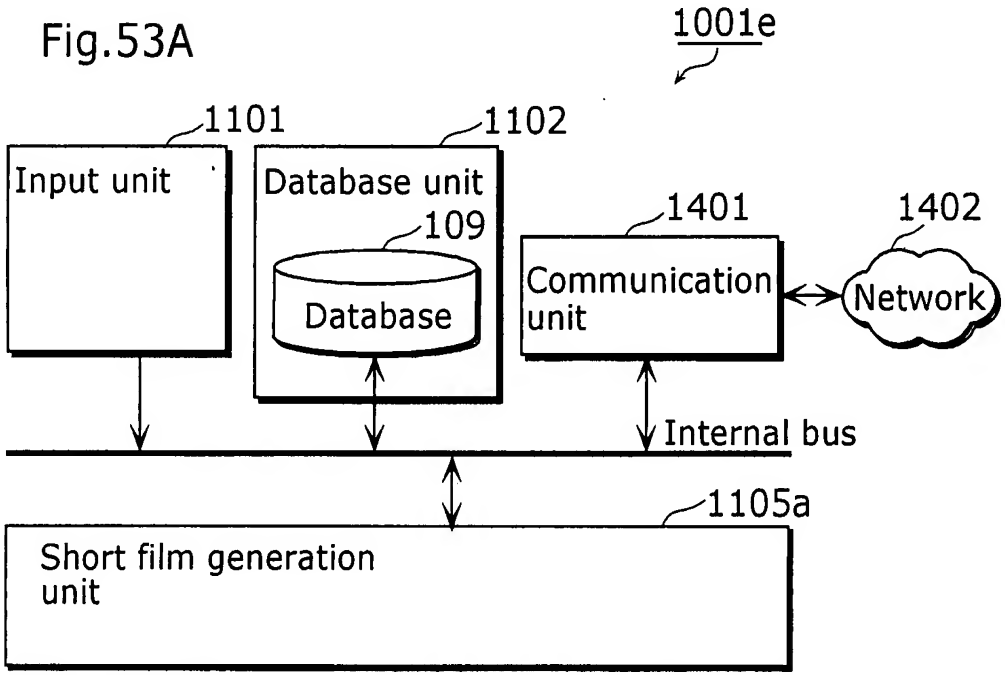


Fig.53B

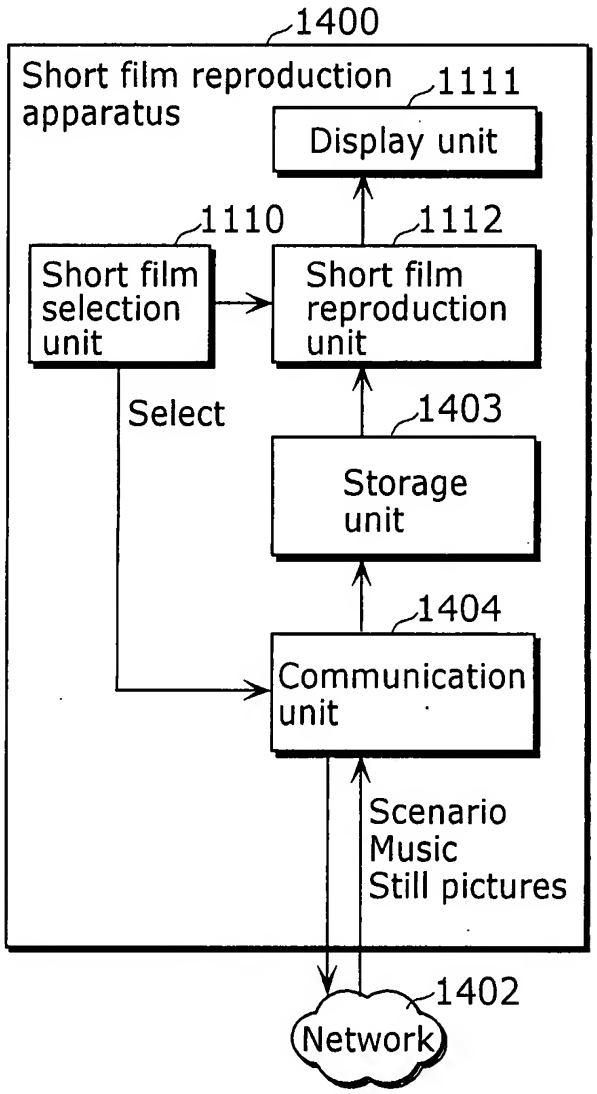


Fig.54

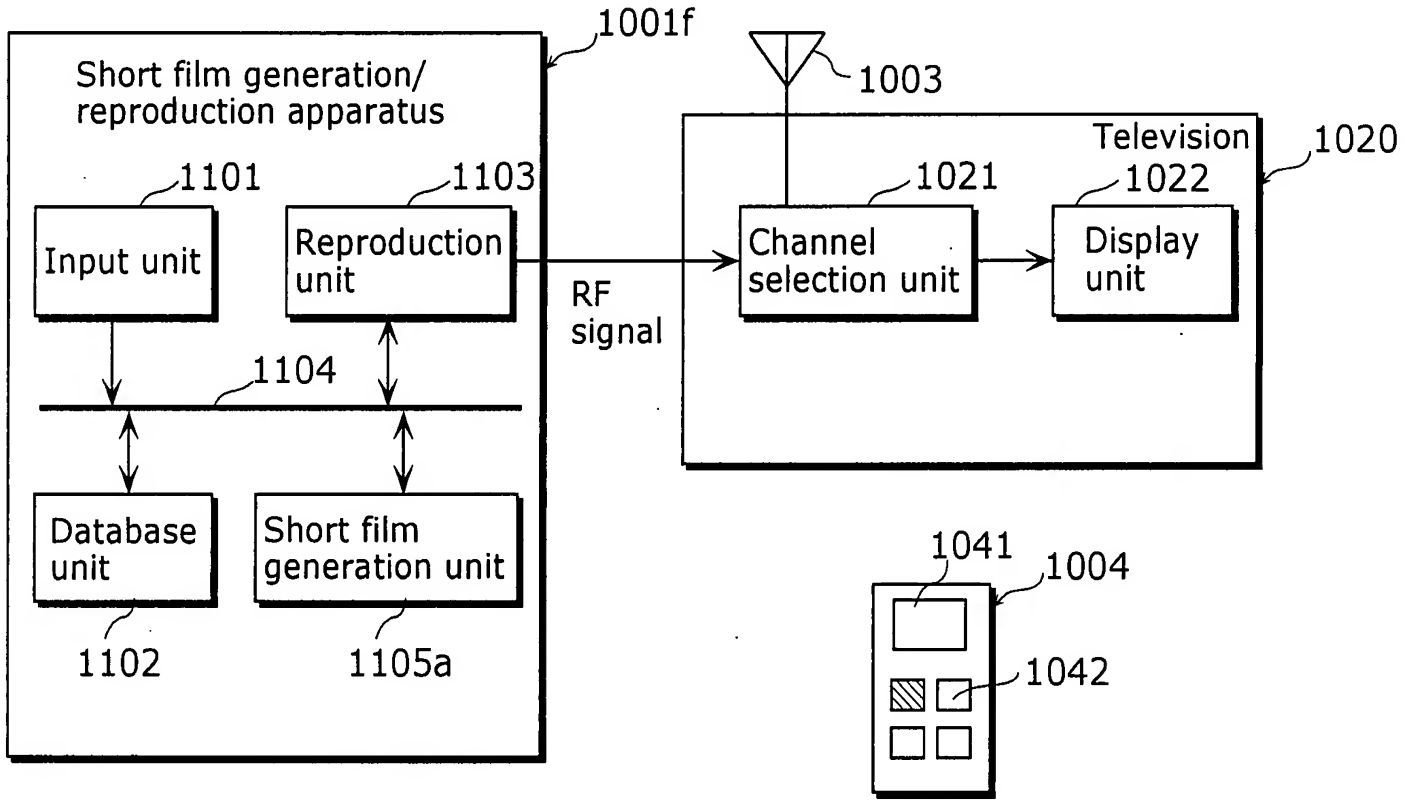

Short film generation/
reproduction apparatus
1001f
1003
Television
1020
1101
1103
1021
1022
Input unit
Reproduction unit
Channel selection unit
Display unit
RF signal
1104
Database unit
Short film generation unit
1102
1105a
1041
1004
1042

Fig.55

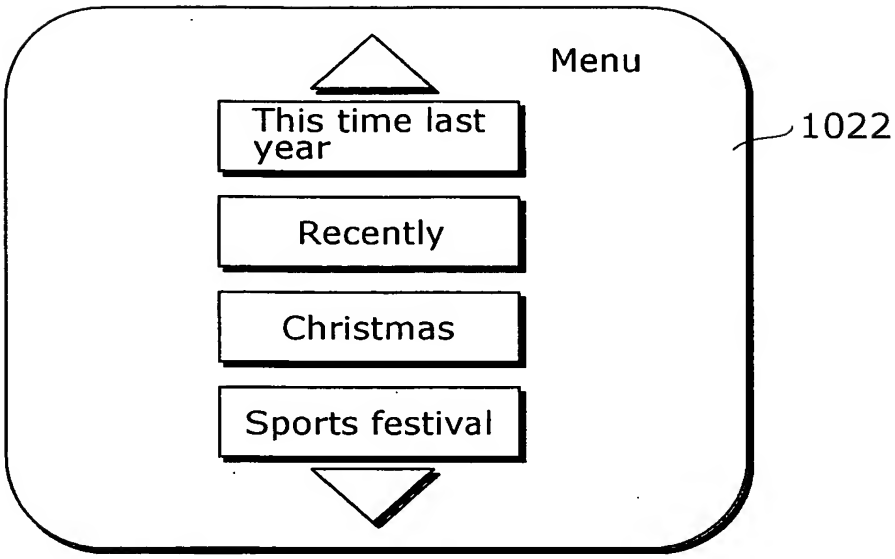

Menu
This time last year
Recently
Christmas
Sports festival
1022

Fig.56

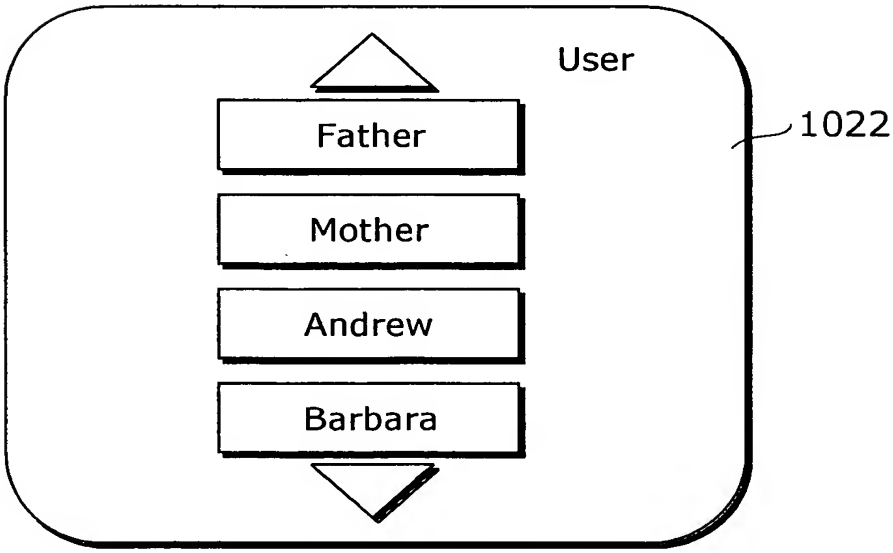

User
Father
Mother
Andrew
Barbara
1022

Fig.57

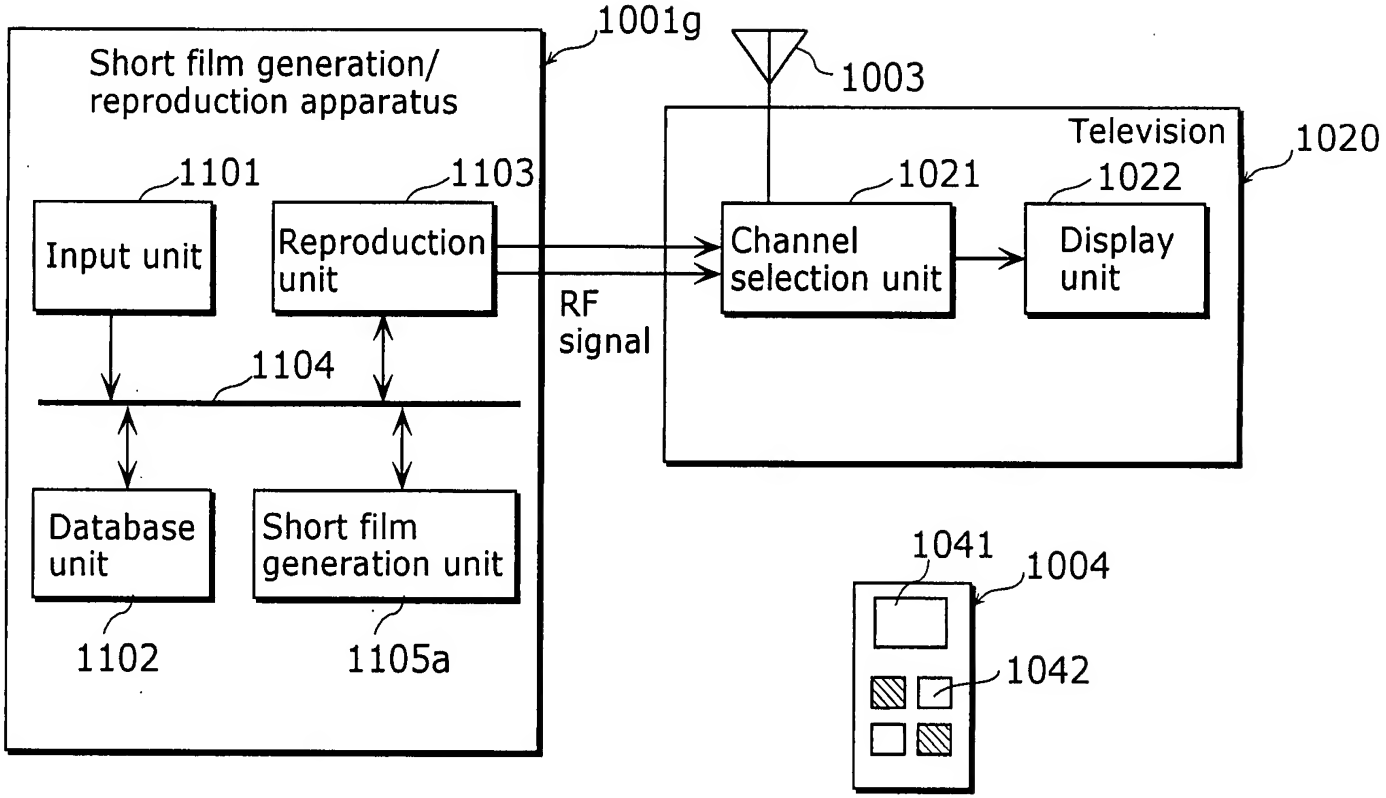
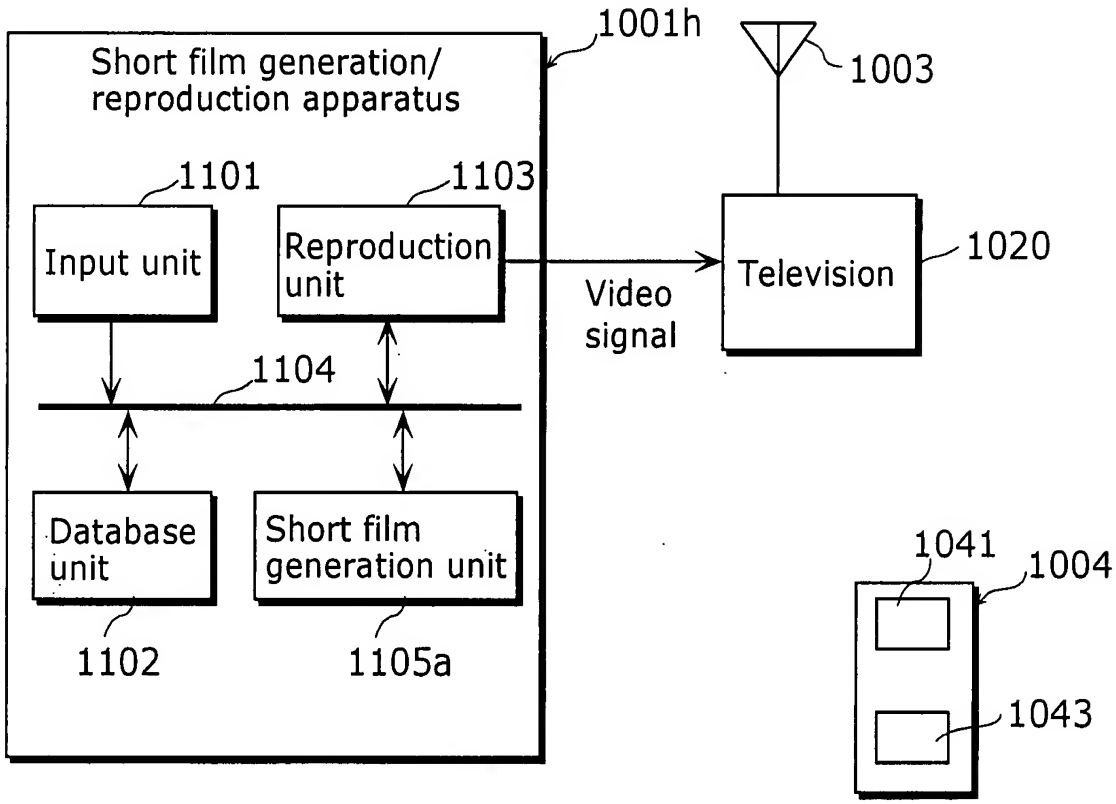

Short film generation/
reproduction apparatus
1001g
1003
Television
1020
1101
1103
1021
1022
Input unit
Reproduction unit
Channel selection unit
Display unit
RF signal
1104
Database unit
Short film generation unit
1102
1105a
1041
1004
1042

Fig.58


Short film generation/
reproduction apparatus
1001h
1003
1101
1103
Input unit
Reproduction
unit
Video
signal
Television
1020
1104
Database
unit
Short film
generation unit
1102
1105a
1041
1004
1043